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A

COLLECTION
OF
PAPERS
ON
NAVAL ARCHITECTURE,

ORIGINALLY COMMUNICATED THROUGH THE CHANNEL
OF THE

EUROPEAN MAGAZINE;

IN WHICH PUBLICATION THE FURTHER COMMUNICATIONS ON THIS
SUBJECT WILL BE CONTINUED.

PART I.

LONDON:

PRINTED FOR THE PROPRIETORS OF THE EUROPEAN
MAGAZINE;

AND SOLD AT THEIR WAREHOUSE, NO. 32, CORNHILL; AND BY THE
PRINCIPAL BOOKSELLERS IN GREAT-BRITAIN AND IRELAND.

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MDCCLXII

P R E F A C E.

WHEN a plain man, whose pursuits have been foreign from mechanics, interferes in matters which may be supposed out of his province, many questions may be asked. It has been, and may again be enquired; to which it may with certainty be answered, to prevent, as much as may be, repetition,

What does the man know of so complex a machine?—Nothing.

What can he ever expect to learn?—Nothing.

What does he expect to get by it?—Nothing.

Can he make a System of Naval Architecture?—Verily, No.

Does he mean to betray the weakness or strength of the Country?—No; there are no secrets that a foreign Minister does not ought to know.

Why then trouble himself or the Public at all?

It is necessary to use a few more words to explain the latter: Having lived in the same central situation he now does, in various capacities, ever since May 1752, he consequently remembers the beginning, conclusion, and principal events of the two last wars; in which periods he had the mortification to observe his countrymen considerably worsted in the beginning of each; and in general the prosperity may be attributed more to the hardiness of the crew than the superiority of the Ships: but this opinion he leaves to be supported or contradicted by those who have had nearer opportunity to observe; and will proceed to explain the motives which gave rise to the following Papers.

It will easily be recollected, or traced by history, the very ill-success of the war with the French, which originated in America prior to the late Lord CHATHAM's administration; the failure of every expedition (particularly that of BYNG), and the near annihilation of our trade by the various captures (pretty well accounted for in Paper Nos. II. and III.), could not but excite considerable alarm,

It was on the news of the failure of one of our naval engagements, that three or four private Ship-builders being in his shop debating the cause of this misfortune, one of them said, " That it ever would be the case, while that business was not studied as a Science, but carried on more by precedent ; that there had not been one improvement in our Navy that did not originate with the French, where there were Schools and Seminaries instituted for the study of it ; that our Ships were not a match for those of that nation either as single or in a fleet," &c. &c.

This discourse much surprised the publisher, who before thought our men of war invincible, and perhaps thought, as is common to youth, one Englishman could beat two Frenchmen ; but on enquiry in a small circle of acquaintance, he found those assertions too true. Of late years, being subject to an asthmatic cough, air and exercise, particularly the sea, have been prescribed to him ; and during his various tours he has been attracted by the dock-yards, both public and private, where the salubrity of the air has been particularly favourable to his disorder. Here also the mind has been employed in viewing the greatest work of human invention, and here he found the opinions of the Builder too much verified. Reflecting on these matters in several solitary excursions, he conceived that he could not employ himself more usefully than in endeavouring to call the attention of his countrymen to so great a national concern.

Having a considerable property in the EUROPEAN MAGAZINE, as well as being the Publisher, he drew up the following Paper and Catalogue of Books, which he had been several years collecting, and now much enlarged by purchase and the helps of a generous Public, and printed both on the Cover of that Work, which has produced the Papers here reprinted *verbatim*, except the additions to the Catalogue. Many more are come to hand, which will appear in future Numbers.

The construction of the Hull is what he is informed should be his wish chiefly to promote ; yet the Rigging, Stowage, Sails, &c. being so nearly allied, will at times have place.

In this Miscellaneous Collection, a better plan cannot be adopted than the HOUGHTON COLLECTIONS ON HUSBANDRY, published in periodical Papers in 1696 ; from which it may fairly be concluded all our improvements in Agriculture took birth.

The manner of printing these Essays on the blue Wrapper of the MAGAZINE, and reducing the plan to so small a scale, are certainly objections that have been complained of by the various contributors; but these objections are overbalanced by the large circulation, by which they may be perused at no expence to those individuals who cannot afford to purchase a large work on the subject. The plans from which they are reduced may be viewed at No. 32, CORNHILL, where two rooms are appropriated for the reception of them.

They will afterwards be collected, reprinted, and sold at the lowest price possible in this form; thus both objections are removed, and so far the subject made more universal than it could be by any other means whatever.

The Publisher cannot take leave, without returning thanks to such Gentlemen as have generously sent him the Models, Plans, and Papers, which form the present Collection, as well as for the offer of Money to carry the scheme forwards. The latter he begs to be excused accepting, at least till a proper plan can be formed for the establishing an Academy, where the ingenious may be convinced that the subject deserves public encouragement.

The result of accurate experiments, such as have been sent, are certainly of great use to the Philosopher; and were those on a large scale, he means the observations that occur to great Ships, which is in the power of every Master or Commander to make, these facts, if they will be kind enough to communicate, will add much to Naval Treasure. Those worthy men employed in the Northern Ships have much in their power,

ADVER.

ADVERTISEMENT.

IT is thought not improper to reprint the following Paper, as being the ORIGINAL ESSAY first introduced into the EUROPEAN MAGAZINE on the subject of SHIP-BUILDING in December 1789, and which has since produced the PAPERS and LETTERS that form the subsequent COLLECTION.

ON THE IMPORTANCE OF THE STUDY of SHIP-BUILDING,

BY

PHILOSOPHICAL AS WELL AS PRACTICAL MEN.

WHATEVER may be the general opinion respecting the ART of SHIP-BUILDING, and its progress towards improvement, we certainly have reason to wish there was a greater degree of pains taken in England to attain that improvement which is so earnestly sought after in other countries, especially in France, where they are allowed by many to rival us in that delicacy of form under water which contributes to fast sailing; and surely this must be attributed to the knowledge obtained in their Academies set apart for that purpose.

In a nation whose very existence depends on the superiority of her NAVY, it is astonishing that there is no place set apart for the instruction of Youth in the Art of Ship-building, and where men of genius might be invited to advance the study of this important science.

As the Navy is the principal consideration at present, let us take a view of the improvements that have been made for some years past, and we shall find them fall very short of what ought to be expected from a Public Board (such as the NAVY-BOARD) which has the constructing of all the Ships belonging to the Navy of England, with very little controul from the ADMIRALTY-BOARD, which is seldom filled with men of science capable of
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giving ideas for the NAVY-BOARD to improve on.---The SURVEYOR then is the only person from whom we are to expect improvement in the construction of the Ships belonging to the Navy; and this person is of so much consequence, that an improvement, even if it come from a Builder in any of his Majesty's Dock-yards, would be thought the greatest indignity that could be offered to the Board.

In order to judge of the improvement in the forms of the bottoms of Ships, we might take a general survey of Ships built in the river Thames, where we shall find the most respectable Builders in the world, and men who have spent great part of their time in the study of this noble art.---These are the men who have likewise the greatest opportunities of improvement; for as the great variety of different classes of vessels trading to the port of London fall under their observation, they have an opportunity of knowing their properties, and might thereby be enabled to improve on a certainty. But though the alteration they make is sometimes for the better, it often happens quite the reverse.

The same may be said of the Navy: That though there are some little alterations made, yet in general they are so trifling, that it seems to be more for the honour of the SURVEYOR that the draught is his own construction, than on any certain ground of improvement; for if these could be proved, neither he nor the Admiralty certainly could be justified in having Ships built at present exactly by the draught of Ships constructed 30 or 40 years ago, as the *Majestueux*, *Orion*, &c. which was the original draught of the *Old Canada*.

An apology may be made for not being certain that the alteration shall be an improvement, from the general opinion, that of two Ships built by the same mould, and rigged exactly the same, one shall sail very well and the other but indifferently. This has been the case in the Navy; and no other cause assigned for it (the ballast and stowage of the Ships being the same), but that the difference of sailing was owing to the management of the Ship by the Officers, and that the rigging or staying of the mast or management of the sails was so different as to occasion all the difference of sailing. In proof of this we are told the following fact, viz. of a Ship that has been remarkable for bad sailing, so as to be the hindrance of the whole Fleet, by obliging them to keep her company; and yet that this very Ship, when another Captain has been appointed to her, who has taken a great deal of pains to find her trim and management of the rigging, has been found to sail as fast as most in the Fleet. But if we thus alledge all to be chance, we shall take away the merit from those worthy Officers in the Royal Navy who have taken great pains to improve their navigable departments.

It is not an uncommon thing to find a Ship under JURY MASTS make as quick a passage (nay sometimes a much quicker) as when full rigged; from which we presume to argue, that our Ships are over-masted. For this and other reasons above pointed out and alluded to, we wish to have the opinions of intelligent professional men on the subject, attested by the necessary facts and calculations.

We are old enough to remember the great difficulty Mr. ROBINS had to introduce SHORT GUNS.---SHEATHING WITH COPPER must be recent in the memory of most naval men of the present age.

However,

However, to render what service we can on such an important national object, we have collected all the Books we could procure on Naval Architecture in this and foreign countries, which may be seen and perused at any time, at the EUROPEAN WAREHOUSE, No. 32, Cornhill. Such Books as we have duplicates of may be purchased; and should any publication on the subject, either ancient or modern, have escaped our search, we request to have information of them, and the expence will be paid with thanks.

We are aware of the difficulty of joining theory and practice; but to the industrious few things are unattainable, and surely as reasonably to be expected in England as in France, where Academies, uniting the mathematician, mechanic, and officer, are set apart for these studies, which in this liberal age we hope to see effected.

The candid Ship-builder will readily confess there is not one improvement in our Navy, that did not originate with the French; and whoever recollects the three late wars, will find that every French Ship taken was refitted and made the chacing Ship, and every officer in the service coveted the command of her in preference to those built in England.

These observations may perhaps excite disgust and enmity in some interested individuals, yet we assure our Readers, that the experienced and scientific observations of any ingenious Correspondent on the subject of SHIP-BUILDING, if written with candour, shall find an early insertion in our Miscellany.

CATA-

CATALOGUE OF BOOKS

ON

NAVAL ARCHITECTURE.

THOUGH this CATALOGUE is much enlarged since that published in DECEMBER 1789, yet, willing to do justice to individuals of our Country, we are convinced that there are many small Tracts that have been printed, and by far a greater number still remain in manuscript, of such modest Authors, who till now had not an opportunity to present the Public with the result of their observations: such we solicit, as a retrospective view of what has been done will be a necessary step to improvement. These shall be inserted in the next Edition; when this CATALOGUE RAISONNÉ will be extended by the help of an ingenious Foreigner.

1. **T**HE Discourse made before the Royal Society 26th November 1674, concerning the Use of *Duplicate Proportion* to sundry Particulars, together with a new Hypothesis of Springing and Elastic Motions. By Sir William Petty, Knt. F. R. S. London, 1674. 2mo. 135 Pages.

This little book has two dedications, one to the Duke of Newcastle, and another to the Royal Society. It is divided into seventeen Instances or Heads; 1. Drawing or Driving Powers which force Ships through the Water, 2. Shapes or Sharpness of Bodies. 3. Strength of Timbers. 4. Effect of Oars. 5. Motion of Travelling Horses. 6. Strength and Velocity of Mills. 7. Effects of Gunpowder. 8. Distance of Sound. 9. Distance of Smell. 10. Distance of Sight. 11. Time of Returns by Vibrating Pendulums. 12. Lives and Duration of Men. 13. Musical Sounds. 14. Effects and Motion of Fire. 15. Rising and Falling of Bodies. 16. Bellows. 17. Prices of Masts, Diamonds, Timber, Amber, Loadstones, &c. 18. Mill-dams and Sea-banks. 19. Compression of Wool and other Elastic Bodies. With an Appendix. The whole is treated with that precision and clearness which this great man usually did other subjects. It is not in either the English or Irish Edition of his

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his Works ; we therefore propose to reprint it here, unless the noble Marquis would favour the world with a new edition of his works, many of which lie scattered about ; and some very valuable ones, we are informed, are yet in MS.

2. Navigation and Commerce, their Original and Progress : Containing a succinct Account of Traffic in general, its Benefits and Improvements : Of Discoveries, Wars, and Conflicts at Sea, from the Original of Navigation to this Day ; with special Regard to the English Nation, their Voyages and Expeditions, to the Beginning of our late Differences in Holland ; in which his Majesty's Title to the Dominion of the Sea is asserted against the novel and late Pretenders. By J. Evelyn, Esq. F. R. S. London, 1674. 120 Pages.

3. Dr. Wallis's Treatise on Algebra, Historical and Practical ; shewing the Origin, Progress, and Practice thereof, and by what Steps it hath attained to its present Height ; with the Addition of the *Cono-Cuneus*, or Shipwright's circular Wedge ; done at the Instigation of Lord Brownlow and Mr. Pitt, Commissioner of the Navy. Fol. 1685.

This is a work of deep mathematical learning. We have the Sections of the *Cono-Cuneus* cut according to the directions of Dr. W. for the satisfaction of the curious.

4. *Colloquia Maritima* ; or, Sea Dialogues, treating, 1. Of the Office of Commander in Chief. 2. Of the Duty of inferior Officers and Mariners on board his Majesty's ships of war. 3. Victualling of Ships. 4. Dictionary, or Explanation of Parts of a Ship ; Sea phrases, or Words of Art used at Sea. 5. Of the Best Ships of War, and Ceremonies of Entertainment, Salutes, Haling, and Striking. 6. Ordering Fleets in Sailing-Chases, Boarding, and Sea fights. By N. Boteler, Esq. formerly a Commander in one of his Majesty's Ships of War. Printed at London 1688.

This is a more curious than useful book at the present time, as most of it is much improved on in the publications of modern date. The following extract will serve to shew the opinion of the industrious author, and his zeal for the service :

ADMIRAL. But what say you touching the fashion and form of their building and contriving ?

CAPTAIN. I say that the three-decked ships, built flush fore and aft, without any falls or steps up or down (which both hinder the ready passage of men to and again, and pester the ship besides), and that have double forecastles, and their bulk and cubbridge-heads full musquet proof, and so in flank one with another, as that they may every way scour their decks with their ordnance laden with cases-shot, and having loop-holes for the musqueteers in covert, commanding every inch of them aboard, are thus far ships impregnable that they are not to be forced by any boarding, unless given up by treason or cowardice. But in these ships a prime care and regard is to be taken that they be roomy betwixt the decks where the ordnance lie, that so the guns may be more usefully managed, and that those that ply them may make the surer shots, and be less annoyed with the smoke of the powder : and a care is likewise to be had, that in the laying of the decks the lower tier of guns be not lodged too low and near the water (an error found committed in too many of his Majesty's ships royal that are of the old building), but that the lower tier of guns may be carried out in all fighting weathers, without peril of taking in of water at any of their ports : and it is also to be observed, that these ships be not over-float

over-boat built (a fault amongst some others in some of those late built pinnaces call the Whelps); for being so, unless the staying of their masts be very much astward on, they can never sail well by a wind; but proving leeward sailers, they will be soon eaten out of it in a chace of any length: it is to be required also, that the bows and chases of these ships may be so contrived that out of them they may shoot as many guns right forward, and bowing as possibly may be; and that the ports be so cut out, as that the guns lie not right over one another, but so that upon the last yaw of the helm one piece or other may still be brought to bear; to which end also the ports are to be made so large that the guns may be every way traversed.

5. Memoirs relating to the State of the Royal Navy of England for Ten Years, determined 1688, by Sir Samuel Pepys, Secretary to the Admiralty, 12mo. with a Portrait. London, 1690.

This tract shews the miserable state of the Navy at that time. Both waste and neglect had been so great, that there was not a ship that could put to sea in less than four months, when the Monmouth rebellion broke out; on which the King resumed the management, recalled Mr. Pepys from imprisonment in the Tower, and appointed a new Board.

6. New Inventions of Milled Lead for sheathing Ships against the Worm, better for sailing, and cheaper above Cent. per Cent. than the old Way with Boards. London, 1691.

This small book contains the Navy Officer's report of ships sheathed with lead, many objections and answers; also, some MS. remarks relating to that affair; also, A Treatise on Naval Philosophy, written by Sir William Petty, which being a scarce tract, and omitted in his works, we have reprinted.

7. The Seaman's Grammar and Dictionary, explaining all the difficult Terms in Navigation, and the Practical Navigation and Gunner. 1. Most plain and easy Directions how to build, rig, mast, and yard any Ship whatever; with the Manner of working a Ship in all Weathers, and how to manage a Fight at Sea; also the Charge and Duty of every Officer in a Ship, and their Shares; also the Use of the petty Tally. 2. An Abstract of the Art of Gunnery (or Shooting in great Ordnance and Mortar-pieces), wherein the Principles of the Art are plainly taught both by arithmetical Calculations and Tables ready calculated; with the Compositions of the several Fireworks useful in War both by Sea and Land. By Capt. John Smith, sometime Governor of Virginia, and Admiral of New-England. Now much enlarged by Variety of Experiments made by experienced Navigators and Gunners since his Time. 4to. London, 1692. 163 Pages.

8. Gloria Britannica: or, The Boast of the British Seas; containing a true and full Account of the Royal Navy of England, shewing where each Ship was built, by whom and when, its Tons, and Number of Men and Guns, both in Peace and War, at Home and Abroad; together with every Man's Pay, from a Captain to a Cabin-boy. London, 1698.

This is no other than a catalogue, and is amusing to compare with the present list of the Royal Navy; except to observe, that many of them were built in private yards, as Blackwall, Gravesend, Harwich, Bristol, &c. &c. An inference may be drawn whether Government cannot build on better terms in private yards, under proper surveyors. If time is allowed for them to stand on their frames to season, it has been asserted they may; nearly as three for two.

9. An Essay on the Mechanism of the Macrocosm, or, The Dependence of Effects upon their Causes, in a new Hypothesis accommodated to our modern experimental Philosophy : in which are solved several Phenomena hitherto unaccounted for ; as the Cause of Gravitation, Motion, Reflection, Refraction, &c. With a Method to find out the exact Rate that a Ship runs, and consequently the Longitude at Sea. By Conyers Purshall. London, 1705.

X 10. The Ship-builder's Assistant ; or, Some Essays towards completing the Art of Marine Architecture, viz. 1. A General Introduction, wherein is considered the Solid of least Resistance, so far as relates to the Formation of a Ship's Body, &c. 2. Observations for regulating the Price of Timber, with Estimates of the Value of Oak and several other Materials relating to naval Stores. 3. Rules for building any Sorts of Ships, with Tables of Scantling, and Directions for Moulding. 4. A new Method of measuring Tonnage. 5. Rules for Rigging ; to which is annexed, Explication of the principal Terms. By W. Sutherland, Shipwright and Mariner. London, 1711. Thin 4to. 165 Pages.

✓ 11. Great Britain's Glory ; or, Ship-building Unveil'd : Being a general Director for building and completing the said Machines. By William Sutherland, Author of The Ship-builder's Assistant. With a Portrait of George I. surrounded by Ships. In Two Parts ; the first containing 134 Pages, and 26 of Introduction ; Part II. contains 286 Pages, chiefly on the Price of Materials and Labour. Folio. London, 1717.

For Character see Capt. Muller's Letter, p. 8. & seqq.

12. The Secret History of his Majesty's Ship-yard at Deptford ; giving an Account of some material Transactions since its beginning until the Year 1716. Duodecimo. 40 Pages. London, 1717.

This small tract contains a short account of the principal officers and builders, and their peculation ; is written with some acrimony, no way interesting to our undertaking, except to prove, that in those days ships not *sea-worthy* were fitted up at great national expence.

13. The Timber Tree Improved ; or, The Best Practical Methods of Improving Lands with proper Timber, and those Fruit-trees whose Woods make the most profitable Returns to their Owners. By William Ellis, of Little Gaddesden, Herts. 8vo. 110 Pages. London, 1738.

14. The Motion of Fluids Natural and Artificial, in particular that of Air and Water, in a familiar Manner proposed, and proved by evident and conclusive Experiments and Remarks, done with such Plainness and Perspicuity as that they may be understood by the unlearned, for whose Sake is added a short Explanation of uncommon Terms, which in treating this Subject could not be avoid'd without Affectation. Second Edition. With Nine Plates containing many Figures in each Plate. 8vo. London. 1738. 369 Pages.

15. The Theory of working Ships applied to Practice ; containing the principal Rules for Sailing with the greatest possible Advantage, by Mons. Pitot, of the Royal Academy Paris. Translated by Edmund Stone, F. R. S. 1743.

This book contains many curious problems on the different velocities of bodies, the action of the rudder, the sails, oars, lee-way, &c. &c. worthy the study of the curious.

16. Harleian Miscellany, Vol. I. containing a Collection of scarce, curious, and entertaining Pamphlets and Tracts, as well in MS. as Print, found in the Earl of Oxford's Library. London, 1744. 4to.

In this large collection we find but few papers on the Navy. This volume contains one on the danger of a threatened Invasion, by a Kentish Gentleman,

Gentleman, 1761. : Orders sent to the Duke of Medina to be observed in his Voyage to England : A Discourse on the Spanish Invasions : An Inquiry into the Causes of our naval Miscarriages : With a few more Tracts that seem to pertain more to Politics and Government of a Marine than Construction, consequently not strictly within our plan.

17. History of the Female Shipwright, to whom Government has granted a Pension of Twenty Pounds per Annum during Life. Written by Himself. 12mo. London, 1773. 191 Pages.

18. Heart of Oak the British Bulwark : Shewing, 1. The Reasons for paying greater Attention to the Propagation of Oak Timber than has hitherto been manifested. 2. The Insufficiency of the present Laws to prevent the Want or Scarcity of that Commodity. 3. The Testimony of the most eminent Timber-merchants, Shipwrights, &c. proving not only the great Decrease, but the proportionate Decrease, for 30 or 40 Years back. of the full-grown Timber, fit for the Navy or Merchant Service, in the principal Timber Counties through the Kingdom. 4. That the Neglect of Planting, if not immediately remedied, will be the Ruin of the Kingdom. 5. The Author's Opinion what would be the most effectual Method to prevent this Calamity. Humbly offered to his Majesty and the Parliament, as well as to all Proprietors of Land in Great Britain. By Roger Fisher, Shipwright of Liverpool. London, 1763. 4to. 97 Pages.

“ Mr. Fisher humbly offers these particulars to the consideration of his Majesty and Parliament, as well as all Proprietors of Lands in Britain ; and certainly the subject is of the utmost weight and importance. The general inattention of late years to a circumstance so interesting to the whole nation is really astonishing ; but it is to be hoped, the laudable regard paid to this, among a multitude of other useful articles, by the worthy Society for Encouragement of Arts, will greatly contribute to excite such a spirit among our landed gentlemen, as may not a little conduce towards remedying the Evil so pathetically set forth by the Author of this valuable tract ; a tract for which he deserves the thanks of every one who wishes well to the security and prosperity of these kingdoms.”

Monthly Review, vol. 29. p. 473.

19. The Ship-Master's Assistant : containing complete Information as well to Merchants, Masters of Ships, and Persons employed in the Merchants Service, as to Officers and others of the Royal Navy, relative to the Mercantile and Maritime Laws and Customs. 3d Edition, improved and enlarged. 8vo. 1790.

Though this book does not properly class with our design, yet there are several pieces of knowledge not to be obtained in any other manner, except by references to Acts of Parliament, Admiralty orders, and other informations difficult of access. It has also the section of a first rate, with explanation of all its parts, by reference, very useful to the young sailor ; who for want of instructions in a seminary of these useful, though common, knowledge, much time and labour is wasted to obtain.

20. A Treatise on Ship-building and Navigation ; with a Supplement, containing a Translation of M. Bongher and Mr. Du Hamel's Method of finding the Centre of Gravity, with 23 Copper-plates. By Mungo Murray, Shipwright of his Majesty's Dock-yard, Deptford, 4to. 2d Edition, 1764.

An ingenious, laborious publication, compiled with great industry ; his chief source, particularly such as are scientific, derived from the French authors. The book is out of print, and probably will remain so, as we hope to see a better supersede it.

21. *Mathematical Tables*: Containing common Hyperbolic and Logistic Logarithms; also Sines, Tangents, and Versed Sines, both Natural and Logarithmic; together with several other Tables useful in Mathematical Calculations, To which is prefixed, a large and original History of the Discoveries and Writings relating to those Subjects, with the complete Description and Use of the Tables. By Charles Hutton, LL. D. F. R. S. Professor of the Mathematics in the Royal Academy of Woolwich. A very large 8vo. Volume, neatly printed, London, 1785.

This book comes not under our class of construction; but the use of logarithms being so great in all calculations, and particularly in Curve Calculations, we mention it only to notify such aid, it being in many respects superior to preceding books of logarithms.

22. *Naval Evolutions; or, a System of Sea Discipline*: Extracted from the celebrated Treatise of P. L. Hoste, Professor of the Mathematics in the Royal Seminary of Toulon, confirmed by Experience. Illustrated by Examples from the most remarkable Sea Engagements between England and Holland, with Copper Plates, adapted to the Use of the British Navy. To which are added, an Abstract of the Theory of Ship-building; an Essay on Naval Discipline, by a late experienced Sea Commander; a General Idea of the Armament of the French Navy, with some practical Observations. By Christopher O'Bryen, Esq. Lieutenant of his Majesty's Navy. 4to. 1762.

23. *Regulations and Instructions relating to his Majesty's Sea Service*, established by his Majesty in Council. 11th Edition. 4to. 1782.

This book is usually given with the commissions to the commanders, and contains the rules for the government of the royal navy when equipped.

24. *An Earnest Address to the People of England*, containing an Enquiry into the Cause of the great Scarcity of Timber; with some Hints towards the more effectually securing and preserving the same, particularly that Part of it applied to Ship-building. London, 1766. 8vo. 77 Pages.

This small pamphlet is written in dialogue. The calculations seem to be very accurate as to the state of the navy, the quantity of timber requisite to build the different Rates. But its chief design is to prove the waste of timber consumed by the artificers being allowed a bundle of chips twice a day, which they carry away as perquisite for fuel. His calculation is, that three quarters of an hour's labour is lost in destroying useful pieces, which he calculates for fifty years past has cost the Government between two and three millions of money. He says, allowing the men threepence a day, with which they would be content, would not amount to above one quarter of that sum.

The publisher, still living, but retired from business, says, it was written by Mr. Yeomans Lott, that 1000 were printed and soon sold, inasmuch that he could not get a copy, of which he has been in search for many years back; that Lord Sandwich sent for him, and gave, or rather created, a place of master-measurer to the sawyers; that he was removed to Plymouth, and enjoyed this place to his death.

25. *An Universal Dictionary of the Marine; or, A Copious Explanation of the Technical Terms and Phrases employed in the Construction, Equipment, Furniture, Machinery, Movements, and Military Operations of a Ship*. Illustrated with a Variety of Original Designs of Shipping, in different Situations; together with separate Views of their Masts, Sails, Yards, and Rigging. To which is annexed, a Translation of the French Sea Terms and Phrases; collected from the Works of Messrs. Du Hamel, Aubin, Saverion, &c. By William Falconer, Author of "The Shipwreck." 4to. 4th Edit.

26. A general View of the Dimensions of the most approved Ships of each Class in the British Navy, with the exact Dimensions of their Masts, Yards, Rigging, Blocks, Guns, Gun Carriages, Anchors and Cables, according to the Establishment of 1778. On a single Sheet of Paper, in Form of Table or Map.

27. Hutchinson's Treatise on Practical Seamanship, with new and important Hints and Remarks relating thereto. Designed to contribute something towards fixing Rules, upon philosophical and rational Principles, for the Form, Proportion and Dimensions in Length, Breadth, and Depth of Merchant Ships in general, and the Management of them, &c. Second Edition, enlarged, 4to. 15s.

This book is well known among the Masters of the Royal Navy, as well as Commanders of Merchant Ships; is very useful to the young seaman, written in a plain though singular style; two editions have been sold, and the work is in much request. The author, now near eighty years of age, harbour-master of Liverpool, is in a lively good state of health, is reprinting the work, with that enthusiasm that every well-wisher of nautical knowledge must commend, and we hope will live to finish it. The style, though not agreeable to the modern language, carries originality with the information it conveys.

We are obliged to foreigners, who frequent our docks, and generally visit those of the coast, to improve themselves, for this information; who speak of the old man with reverence, as to his self-acquired knowledge and behaviour.

28. Marine Architecture; or, Directions for carrying on a Ship from the first laying of her Keel to her actual going to sea; with Tables of Proportions for Timbers, Masts, Yards, Cordage, &c. By Edmund Buxnel, Shipwright. 8th Edition. 1716.

This contains many wooden cuts, tables, &c.; perhaps the best of its time, if not the only one.

29. An Essay on Naval Tactics, systematical and historical, with explanatory Plates. In Four Parts. By John Clark, Esq. of Eldin, Fellow of the Society of Antiquaries, and of the Royal Society of Edinburgh. 4to. Boards. 10s. 6d.

The first part of this work contains thirty plates, on attack of single ships and great fleets, with remarks on the engagements of the late two wars; and theorems.

30. The Art of War at Sea; or, Naval Tactics reduced to new Principles, with a new Order of Battle. Illustrated with Copper-plates. Translated from the French of Viscount de Grenier, Rear-Admiral of the French Navy, by the Chevalier de Saufeuil. 4to. 1788.

This publication does not strictly rank in our intended plan, as it tends chiefly to order of battle, manœuvring, &c. &c. We trust there are professional men in our service capable of judging if any superior merit is in it.

31. Naval Architecture: or, The Rudiments and Rules of Ship-Building, exemplified in a Series of Draughts and Plans. With Observations tending to the further Improvement of that important Art. Dedicated, by Permission to his Majesty, by Marmaduke Stalkaart.

32. A Naval Expofitor; shewing and explaining the Words and Terms of Art belonging to the Parts, Qualities, and Proportions of Building, Rigging, Furnishing, and Fitting a Ship for Sea; also all Species that are received in the Magazines, and on what Services they are used and issued. Together with the Titles

of all the inferior Officers belonging to a Ship, with an Abridgment of their respective Duties. By Thomas Riley Blankley, 4to.

This was undoubtedly the best Book of Instructions to explain to young seamen the parts and uses of every thing on board ; but is now superseded by Lescallier's Vocab. de la Marine, in French and English, a more copious and convenient book, in 8vo.

33. The Manœuverer, or Skilful Seaman ; being an Essay on the Theory and Practice of the various Movements of a Ship at Sea, as well as naval Evolutions in general. Translated from the French of M. Bourde de Villehues, by the Chevalier de Saufeuil, with 13 Copper-plates. Dedicated to Prince William Henry, 4to.

34. The Ship-Builder's Assistant, or Marine Architecture: Containing, 1. Decimals, Extraction of the Roots, Geometry, and Mensuration, with Rules for finding the Contents of Plank and Timber; also the Tonnage of Ships. 2. Observations on the Nature and Value of Timber, and how to procure it of the necessary forms. 3. Method of drawing Plans of Ships and Moulding the Timbers, with practical Rules to be observed in building the Hulls of different Ships. To which is added, the Scantlings or Dimensions of Ship Timber. 4. Directions for making Masts and Yards in just Proportion to the Ship and to each other; also Tables of the Weights and Sizes of Anchors and Cables, according to the new Establishment. 5. The Boatswain's Art, shewing the Length and Thickness of each Rope; also Cable and Cordage Tables, shewing by Inspection the Weight of any Rope, with Directions for cutting out Sails. By William Sutherland, Shipwright and Mariner.

35. A Complete Theory of the Construction and Properties of Vessels; with practical Conclusions for the Management of Ships made easy to Navigators. Translated from the French of the celebrated Leonhard Euler, by Henry Watson, Esq. 8vo. With Plates, in Boards.

This author (in Latin, 2 vols. 4to.) is allowed to be the Euclid of the science in all countries; he is studied, translated, and quoted by all as the foundation: and much praise is due to Mr. Watson, who, at his own expence and great labour, gave his countrymen this translation, which was chiefly done while he was constructing docks and building two ships in Bengal, where he could only procure the French copy. It is said, there are some mistakes by this means, but of no great consequence.

“ The value of the original work, of which this is a translation, is well known to those who are acquainted with the mathematical principles of hydraulics. It is the most complete scientific treatise on this subject, as far especially as it relates to the construction and management of ships. But those who are conversant with foreign publications of this nature are well apprised, that every language has technical terms and phrases peculiar to itself: the present translation is on this account the more valuable; it is undertaken with a view of rendering the more abstruse and mechanical part of nautical science generally understood.

“ The work is divided into three Books: in the first Book, the author considers vessels in equilibrium and at rest; and, by a variety of mathematical investigations, determines the stability of different vessels, and lays down rules for this purpose. He closes with recommending in general, and as the most effectual means of augmenting their stability, to carry the centre of gravity as low as possible. The second Book contains an investigation of the resistance which vessels experience in their course, and of the action

of the rudder. The third Book treats of masts and the management of vessels. To the whole is added, a supplement upon the action of oars."

M. REVIEW, Vol. LVIII. page 83.

36. A new Edition, with the Author's last Additions and Corrections, of Mr. Ludlam's Description and Use of Hadley's Quadrant.

37. An Introduction and Notes on M. Bird's Method of dividing Astronomical Instruments. To which is added, a Vocabulary of English and French Technical Terms. By William Ludlam, late Fellow of St. John's Cambridge.

38. An Essay on the Mechanism of the Macrocosm; or, The Dependence of Effects upon their Causes. In a new Hypothesis accommodated to our Modern and Experimental Philosophy. 8vo. No Date.

Plans of the docks.

39. The Ship-BUILDER'S Repository; or, A Treatise on Marine Architecture: Wherein are contained the Principles of the Art, with the Theory and practical Parts fully explained, and every Instruction required in the Building and Completing a Ship of every Class, from the Forming of the Draught to the Launching into the Water. Calculated to the Capacity of Young Beginners. Compiled and digested in a Manner entirely new, and laid down different from what has hitherto appeared on the Subject. The Whole being intended as a Complete Companion for those Naval Architects desirous of attaining a Complete Knowledge of that important Art. 4to. No Date. Printed about 1784.

This book contains the dimensions of the principal ships of the Royal Navy, very exact, with some judicious remarks on their property, and an exact draught of an eighty gun ship. The author intended adding a draught of each class. He was brought up in a Royal yard, was very industrious; but was discharged for copying draughts, and having papers in his possession. Such is the jealous infatuation, that the superior officer in our *establishment* does not wish any workman to be possessed of more knowledge than to handle and know the use of his tools: this is done under pretence of secrecy, in keeping our arts from our enemies; which pretence is carried so far as to exclude a Briton admittance without especial orders and a porter to attend him, while foreigners of any nation, if clothed in an officer's uniform, find ready admittance.

40. Abstract on the Mechanism of the Motion of Floating Bodies. By M. De La Croix, Commissary General of the Marine, &c. &c. Translated from the French, and published by Admiral Knowles, and now re-printed. 1s. 6d.

"This little treatise contains more knowledge in the art of ship-building than any book hitherto published, that I have met with. The principles the author proceeds upon are just and true: I have verified them by a number of experiments, and they agree exactly with the calculations he gives; but what proved most satisfactory to me, was their answering perfectly well, when put into practice, in several line of battle ships and frigates that I built whilst I was in Russia.

CHARLES KNOWLES."

41. A Treatise of Universal Inland Navigations, and the Use of all Sorts of Mines. A Work entirely new. Recommended to the Inhabitants of Great Britain and Ireland, Plainly demonstrating the Possibility of making any River and Stream of running Water in the World navigable, by Canals of a new Construction, without Lock, and Dams, with Estimations of the Expence of the Making

Making thereof per Mile in Length. Together with the Construction, Explanation, and Use of a new-invented Mechanical and Hydraulical Machine, for inland Navigation, of this new Construction, which will raise, on an inclined Plane, Boats or Lighters and Cargoes all at once, even to Fifty Fathoms in Perpendicular, without unloading. To which is added a Supplement, plainly demonstrating the Possibility and Means whereby a Ship of any Size may be launched at any Time, except at Low Water, without waiting the Time of High Water: Together with the Construction, Explanation, and Use of a Machine for that Purpose, with Tables to shew the Power and Force required to draw or roll a Ship up upon a Launch of any Size not more than Two Thousand Tons. By Edmund Leach, Surveyor. 8vo. London.

42. Advice to Officers of the British Navy. 12mo. London, 1785. 116 Pages.

43. Silva; or, a Discourse on Forest Trees, and the Propagation of Timber, as delivered before the Royal Society in 1661. By Sir John Evelyn. A new Edition, with many Improvements, by Dr. Hunter, of York; and elegant Prints. 4to. 1786.

This book is justly esteemed, and may be esteemed an English classic; had we a division so called, it would stand one of the foremost.

44. Descriptions and Sketches of some remarkable Oaks in Welbeck Park, in Nottinghamshire, a Seat of the Duke of Portland. With 10 Plates neatly executed by Mr. Ellis, and 23 Pages of Letter Press, containing some judicious Remarks on the Durability of that Wood. 4to. 1790.

45. The Navy Royal; or, A Sea-Cook turned Projector: containing a few Thoughts about Manning our Ships of War with the best Sailors without Violence, in the most pleasing Manner, according to a fourth Article of a late Proposal published by our worthy Chaplain of his Majesty's Ship the Lyme. By Barnaby Slush, Cook of the said Ship. 12mo. 122 Pages. With a Preface.

This book belonged to M. Dominicus, a builder. There is this MS. note at the beginning: "The writer, under a feigned name, gives a detail of all the various cheats and abuses practised on board a man of war."

46. A Report from the Committee appointed the 11th Day of March 1771, to consider how his Majesty may be supplied with Timber. Published by Order of the House of Commons 1771, Folio, 89 pages; with a Plate, describing the Knees and Timbers of a 74 Gun Ship.

In this book is contained the opinions of the most eminent builders on this material point.

47. The Principles of Naval Architecture, with Proposals for the Form of Ships. To which is added, Some Observations on the Structure of Wheel Carriages, for the Purpose of inland Commerce, Agriculture, &c. By Thomas Gordon, Esq. 8vo. 197 Pages; with an Alphabetical Index explaining the Technical Terms used in the Work, and five Copper-plates. 6s.

"However chimerical this work has been thought, there is more philosophy in it than can be found in any other English author on this subject; the grandest scheme it contains was in part executed by Sir William Petty." See his will, printed in page 108, 109, 110, of EUROPEAN MAGAZINE for August 1782, to which is subjoined the following note:

"In 1663, he raised his reputation by the invention of the double-bottomed ship, against the judgment of almost all mankind; for in July, when

when at first the ship ventured from Dublin to Holyhead, she stayed there many days before her return, which made her adversaries insult, and discourse the several necessities why she must be cast away: but her return in triumph, with those visible advantages above other vessels, checked the derision of some, and encalmed the violence of others, the first point being clearly gained, that she could bear the sea. She turned into that narrow harbour against wind and tide, among the rocks and ships, with such dexterity, as many ancient seamen confessed they had never seen the like. It appeared much to excel all other forms of ships in sailing, carriage, and security: but at length, in its return from a voyage, was destroyed by a common fate, and such a dreadful tempest, as overwhelmed a great fleet the same night; so that the ancient fabric of ships had no reason to triumph over the new model; when of seventy sail, that were in the same storm, there was not one escaped to bring the news. A model of this ship is still kept up in the repository of Gresham College, which he presented them, made with his own hands.

On the strictest enquiry at the Gresham rooms, no satisfactory account where it is: should it be still in being, we hope the possessor will be kind enough to let it be seen. Indeed, we are at a loss to guess by what means the Gresham Trustees can suffer such waste to be made in so valuable a collection.

48. The British Mars; containing several Schemes and Inventions to be practised by Land and Sea against the Enemies of Great Britain, shewing more plainly the great Advantage Britain has over other Nations by being Masters at Sea. In Two Parts. I. The Construction of Boats both to stow in less Room of Ships, and go swiftly to discover an Enemy's Coast, and to land and embark Troops with greater Safety; also to construct Vessels to lie nearer the Shore, to better protect the Troops in landing or embarking; also rolling Defences to be used as floating Batteries, or as Floats for landing Cannon, &c. and for making Defences and Batteries on Shore more expeditiously, and for filling up Ditches, &c. Also contains a Method to fit old Ships of War, and small floating Batteries, to batter Land Defences with greater Force; and another Method to fit old Ships of War (that cannot be sunk by shot) to lie before Batteries and receive the Shot while other Ships pass by: With Remarks and Observations. Part II. contains Methods to fortify Dwelling-houses, that even Women and Children may defend themselves from Indians with small Arms: Designed for our Settlements in America and other Places: Also a new Method of Fortification and making Batteries. To which is added an Appendix, containing a Scheme for manning the British Navy with less Grievance to the Subject, and a Scheme to employ Seamen: Of a Copper Mine near Hudson's Bay; and of discovering the North-West Passage, or determining there is no such Passage; with Cautions and Directions. By Joseph Robson, Engineer. The Whole illustrated by Eleven Plates. London, printed for the Author; and sold by William Flexney, near Gray's-Inn Gate, Holborn, 1763.

FRENCH AUTHORS.

1. *Theorie de la Manœuvre des Vaisseaux.* Paris, 1689. De l'expresse Commandement de sa Majesté. With many Figures. No Name of Author.

2. *Traité de la Construction des Vaisseaux, avec des Eclaircissements et Demonstrations touchant l'Ouvrage intitulé Architæura Navalis Mercatoria, &c.* Par Frédéric Henri de Chapman, Chevalier de L'Ordre Royal de L'Épée. Premier Constructeur des Armées Navales, et de L'Académie Royale de Stockholm. Traduit de Suedois, 4to. Paris, 1781. 1l. 1s.—We have in our possession one copy of the 6; Draughts of the above ingenious Author, for the Inspection of the Public.

3. *Elements*

3. *Elémens de L'Architecture Navale, ou, Traité Pratique de la Construction des Vaisseaux.* Par M. Du Hamel de Monceau. Seconde Edition, 4to. Paris, 1758.

4. *Taëique Navale ; ou Traité des Evolutions et des Signaux ; avec Figures en Taille-douce.* Par M. le Viscomte de Morogues, Capitaine de Vaisseaux du Roi, Chef de Brigade du Corps Royal de l'Artillerie, Membre de l'Académie de Marine, &c. 4to. Paris, 1763.

5. *Nouveau Commentaire sur l'Ordonnance de la Marine du Mois d'Août 1681,* Par M. Renne Josue Valin, Avocat & Procureur du Roi au Siege de l'Amirauté de la Rochelle. Nouv. Edit. rev. corrigée & augmentée. 2. Tom. 4to. Rochelle, 1776.

6. *L'Art des Armées Navales, ou Traité des Evolution Navales.* Enrichi de Figures en Taille-douce. Par Paul L'Hôte, de la Compagnie de Jésus, Professeur des Mathématiques dans le Séminaire Royal de Toulon. 1. vol. fol. Lyon, 1727.

This book contains 133 plates of Manœuvres, besides those in the Appendix, amounting in the whole to 144, exclusive of head and tail pieces in the Appendix, which treats of construction of vessels in 172 pages.

During the dark, superstitious times that overspread Europe, what knowledge did exist was scarcely visible except in the Society of Jesuits. This book is not improperly styled a Grammar of Naval Science, and is generally believed to have laid the foundation of the French Navy. The Monarch was so charmed with the flattering prospects of power, though his then state was somewhat similar to the present state of the Empress of Russia ; no trade, not even a sugar-island to defend ; consequently an armed fleet could not be necessary, except for ambition or thirst of dominion, which has since been the common disturber of Europe.

7. *Traité sur la Construction des Vaisseaux.* Dedié & présenté au Roi par Mons. le Comte du Mail de Goimpy, Capitaine des Vaisseaux de sa Majesté, &c. &c. 4to. Paris, 1776.

8. *Theorie Complète de la Construction & des Manœuvres des Vaisseaux.* Par M. Leonard Euler. Nouvelle Edition, corrigée & augmentée. 8vo. Paris, 1776.

Cet ouvrage, auquel l'Auteur a adapté les plus profondes connoissances géométriques, est regardé par les connoisseurs comme un des plus parfait en ce genre. Cependant plusieurs de ses calculs sont ou chimère chimériques ou impraticables, par la difficulté de les soumettre aux lignes courbes. On ne peut les regarder que comme des ingénieuses hypothèses, qui pourront par la suite conduire à de grandes vérités, & à la démonstration de ce que l'on cherche,

9. *Traité du Navire, de sa Construction, et de ses Mouvements.* Par M. Bouguer, de L'Académie Royale des Sciences, ci devant Hydrographe du Roy au Port du Croisac, et au Havre de Gras. 4to. Paris, 1746.

Cet Auteur est le premier en France, & même, je crois, en Europe, qui aye soumis à des calculs exacts & profonds l'art de construire des vaisseaux. L'Architecture Navale n'avoit été jusques alors que purement pratique. Il peut être regardé comme le pere de la belle construction moderne Francoise. Ces precepts, quoique quelques fois bien sublimes, sont souvent de la plus grande vérité.

10. Essai Géométrique et Pratique sur L'Architecture Navale, à l'Usage des Gens de Mer. Par M. Vial du Clairbois. 1 vol. large 8vo. Paris, 1776.

11. De la Manœuvre des Vaisseaux, ou, Traité de Mechanique, et de Dynamique; dans lequel on réduit à des Solutions tres simples les Problemes de Marine les plus difficiles qui ont pour Object le Mouvement du Navire. Par M. Bouguer.

12. Fabriques des Ancres, lus à l'Academie en Juillet, 1723. Par Mons. de Rameux. Avec des Notes & des Additions de M. Du Hamel. Folio. With Plates.

13. Architecture Hydraulique. ou L'Art de conduire, d'élever, & de manager les Eaux pour les differens Besoins de la Vie. Par M. Belidor. 4. vols. 4to. Paris, 1737. 1739. 1750. 1770.

14. Dictionnaire de Marine, contenant le Termes de la Navigation & de l'Architecture Navale. Enrichi de Figures représentant divers Vaisseaux, le principal Piece servant la Construction, &c. Seconde Edition, revisée & augmentée. 4to. Amsterdam, 1736.

15. L'Architecture Navale, contenant la Maniere de construire les Navies, Galères, & Chaloppes; & de la Definition de plusieurs autres Especies de Vaisseaux. Avec le Table de Longitude, Latitude, &c. Par le Sieur Daffie, C. P. 4to. Paris, 1677.

16. Nouvelle Experience sur le Resistance de Fluid. Par M. D'Alembert. Planches. 8vo. Par Boffut, Paris, 1787.

17. Vocabulaire des Termes de Marine Anglois & Francois. Par M. Lefcalier. 8vo.

" The confusion occasioned by the difference of the sea-terms among different nations, is often attended with the most disagreeable consequences; and as far as relates to the English and French, the reader will find an excellent preservative against this confusion in the work before us. It is a strong presumption in favour of this work, that its author has been long in the sea-service, has been frequently in England, Russia, and Sweden, and has drawn up this Vocabulary under the auspicious protection of Mons. de Sartine, one of the ablest Ministers in France. He acknowledges the succours he has derived from Mr. Falconer's Dictionary; and has returned this favour by supplying several defects, and correcting many errors in that valuable work. The repeated voyages he has undertaken on board French and English ships, in order to acquire a complete knowledge of all that relates to construction, fitting out, manœuvres, mooring, navigation, rigging, piloting, the management of arsenals and dock-yards, &c. in the two nations; as also, of the different employments and degrees of rank and preferment in the sea-service of England and France, have contributed to give an high degree of accuracy and perfection to this useful work. In the first part, the author gives, in French, and in an alphabetical order, an explication of all the English sea-terms, together with the phrases that are necessary to indicate their various significations; and in the second part he

he gives, in the same manner, in English, an explication of all the French terms. The plates, which are thirty-one in number, are well engraved by Le Gauas; and in the explications which accompany them M. Lescallier has enlarged more on the article of rigging than that of construction; as the latter has been often ably treated, and the former seldom, if ever, treated at all. Our author's account of the galleys of the ancients is learned and curious."

M. REVIEW, Vol. LVI. page 556.

ITALIAN.

Dizionario Istoria, Teorico, e Pratico di Marina. Di Monsieur Savirien. Tradotto dal Francese. Venezia, 1769.

LATIN.

1. Johannis Bernouilli, M.D. Matheseos Profess. Regiarum Societatum Parisiensis, Londinensis, Petropolitanz, Berolinensis, Socii, &c. Opera Omnia. 4 vols. 4to. Lufannæ & Geneva, 1742.

In the second volume of this Work is an *Essai d'une Nouvelle Theorie de la Manœuvre des Vaisseaux*, not in our Collection.

2. Lazari Bayfi Annotationes in Librum Secundum de Captivis, & Postliminio reversis; in quibus Tractatur de Re Navali. Lutetiæ, 2pud Robertum Stephanum, 1549.

It is a commentary on a law of Marcellus in the 49th Book of the Pandects, and is adorned with many wooden cuts.

SPANISH.

Examen Maritimo, Theoretico, Practico, o Tratado de Mechanica aplicado a la Construcccion Conocimiento y Munejo de los navios y demas Embarcaciones. Por D. Jorge Juan, Comendador de Aliaga en le Orden de San Juan, &c. 2. vols. 4to. Madrid, 1771.

MARINE INTELLIGENCE.

In the Press, and speedily will be published,

A View of the Marine Force of the British Empire, in which its ancient State is considered, and several Plans submitted to the Public for its Improvement. By an Officer.

An Ecclesiastic, whose life has been chiefly employed in the study of Naval Architecture Theoretical and Experimental, having been on board D'Orville's and other fleets in their different cruizes and actions, has com-
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piled a very large work, beginning with the minutiae, and proceeding regularly to the most important combinations of a fleet and actions; if our information is right, somewhat similar to Pierre La Hoste, but much more enlarged, and improved to the present time. Whenever this elaborate work is published, we shall take care to be in possession of a copy.

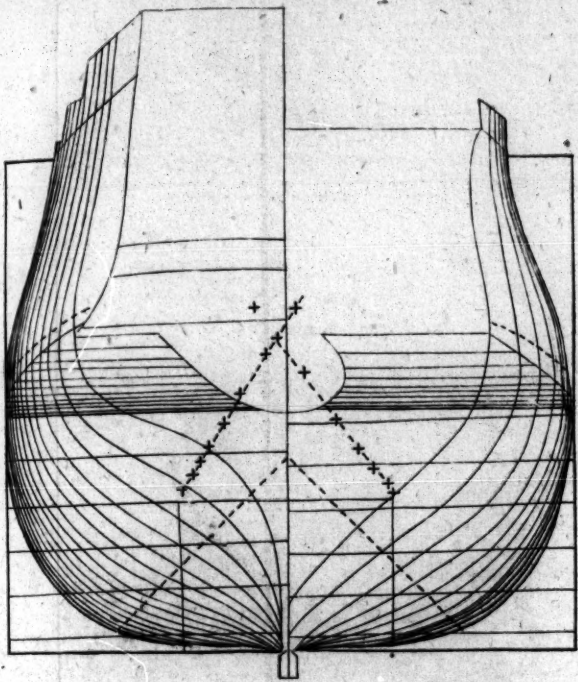
The National Assembly of France have received and adopted a new Treatise of Naval Architecture, said to be more complete than any hitherto published. It is now in the press, and expected to appear in a few months, when we shall take care to be possessed of a copy for inspection of the curious; also some for sale, if they can be procured.

The Assembly have also come to a resolution not to permit any ship, mercantile or others, to be employed, except such as are French-built.

Another work on Masts, Yards, Sails, &c. is on the point of publication in France. Orders are given for several copies.

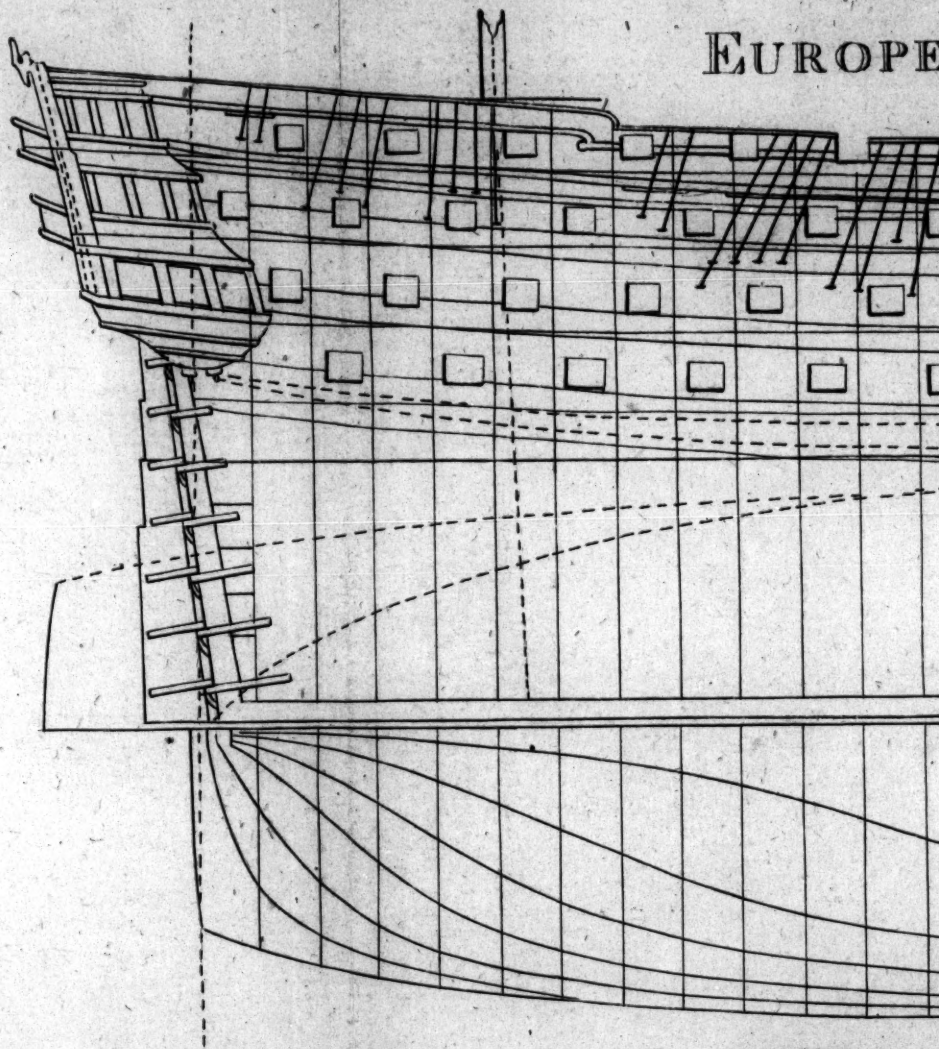
A Correspondent has translated the Abridgment of that elaborate and scientific work from the Spanish of D. George Juan, which is now completed, and we hope will soon be put to press.

SERIES



DRAUGHT of a FIRST RATE.

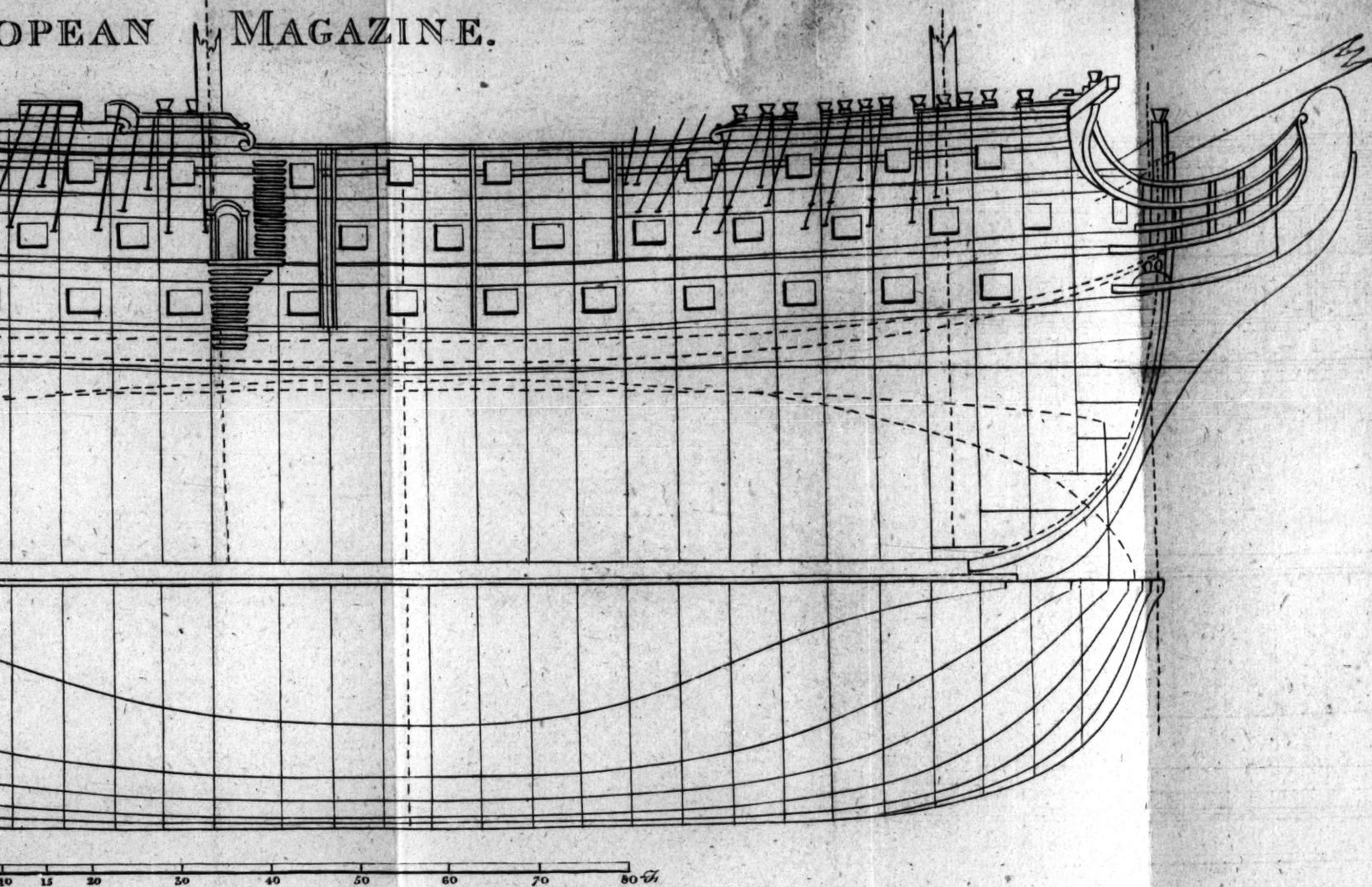
Length Lower deck.....190¹/₄
 Breadth Extreme.....53⁰/₁₀
 Depth Hold.....22⁴/₁₀
 Burthen in Tons.....2332



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Published

EUROPEAN MAGAZINE.



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SERIES OF ORIGINAL PAPERS

ON THE

IMPROVEMENT of the ART of SHIP-BUILDING.

INTRODUCTION.

IT has been the constant wish of the Proprietors of the EUROPEAN MAGAZINE, to establish their work upon the durable basis of public utility; and at the same time, never to lose sight of those lively entertaining topics, which are calculated to unbend the feeling mind, after the fatiguing labours of life, or the severer studies of abstruse science.

To instruct and entertain the young; to invigorate the active in laudable pursuits; to inform the ignorant; to let the recluse, who has sequestered himself in some rural retreat, from the pomp of palaces, and the noisy tumult of crowded cities, know how the great and busy world jogs on; and enable him, in his easy chair, to enjoy, in his mind's eye, all the fashionable public amusements of the age; in fine, to select for the curious the *essence* of literature, *extracted*, by many a tedious lucubratory *process*, from the heterogeneous mass of learned ore with which the BRITISH press daily teems—ever in labour, yet never completely delivered—these are the arduous tasks we cheerfully undertake; and with gratitude we acknowledge, that our reward has been what we aspired to—"confirmed reputation and increasing success."

Thus stimulated to exert ourselves upon every occasion that presents itself, to bring forward subjects of the first magnitude in a great maritime country, unrivalled in ARTS, COMMERCE, and MANUFACTURES—it is with pleasure we announce to our numerous friends and correspondents, the reception of many original papers, including letters from men of abilities; from professional men; and from respectable patriotic citizens possessing ample fortunes, and generously inclined to countenance and support all important improvements in the *interesting Art* of SHIPBUILDING; and in the future management of the naval strength of GREAT BRITAIN—"at once the foundation and the grand bulwark of its pre-eminence and superior consequence in the eyes of all EUROPE."

The organization of our plan must depend in some measure on the favours of our correspondents on the subject, who may be assured that the most diligent attention will be paid to their communications; the earliest grateful acknowledgments will be made upon receiving them; and the Editor will use his best discretion in placing them under their proper heads, in the general arrangement of the classes to which they may peculiarly belong.

For the present, it will be sufficient to trace the *outline* of our NAVAL ARCHITECTURE.

To facilitate the execution of the work, our judicious and industrious Publisher has collected all the books he could procure on the

Art of Ship-building, and the sciences connected with it; which may be seen and perused at any time, at the EUROPEAN WAREHOUSE, No. 32, CORNHILL: and already, in consequence of his request, printed and circulated some time since, to be informed if any had escaped notice, a most respectable and valuable correspondent, Capt. MULLER, Commander of his Majesty's Electoral Guard-ship stationed on the ELBE, off STADE, has favoured us with an additional list, chiefly of foreign authors, which will be purchased with all possible expedition. Further satisfaction will likewise be given to our readers by the appearance of the Captain's letter in its proper place, in one of the early numbers of our series of original documents. In the mean time, we solicit his acceptance of the sincere thanks of the Proprietors of the Magazine, and of the patrons and friends of the plan he has kindly supported by this early valuable communication.

Though the improvement of the ROYAL NAVY, the safeguard of the commercial navigation of the BRITISH Empire, in times of war, is our principal object, yet the plan will embrace every hint, every observation, and every practical recommendation for the benefit of the merchants service. In this view, the assistance of that most able and respectable body of men, the Master Shipbuilders along the banks of the River THAMES, is earnestly requested, more especially as it is *intended*—if that encouragement is given to this national enterprize, which we have reason to expect, from the favourable reception it has met with, on starting it—to construct models of ships and vessels, in the due course of time, with such improvements as have been adopted on the joint opinions of able Mathematicians and skilful Shipbuilders: these models will be preserved for public exhibition at the European Warehouse, or, when their increasing numbers shall render it expedient, in some convenient room contiguous to the Royal Exchange.

From small beginnings great national institutions have frequently been established on an extensive scale. Such, for instance, is the present flourishing Society for the Encouragement of ARTS, MANUFACTURES, and COMMERCE, founded at London in the year 1753, by the indefatigable industry of WILLIAM SHIPLEY, who, without classical learning, plain and simple in his dress and manners, and deriving no advantage from address or elocution, by unwearied personal attendance, found means to engage a few persons of rank and fortune to meet at Peele's Coffee-house in Fleet-street, and to adopt a plan, simple in itself, but capable by improvement of producing the most beneficial effects to the community. What could be more self-evident than the good effects that must be the result of the following dictate of common sense, which struck the mind of the philanthropist so forcibly, that he could not rest, till he had made those who were enabled by their situations in life, and their fortunes, to promote useful undertakings, feel the force of it. "I have resided," said he, "many years at Northampton, where I observed that the annual purses and plates subscribed and given by the nobility and gentry for the encouragement of horse-races, has occasioned such an improvement in the breed of horses in this and the neighbouring counties, that horses are now brought to Northampton fair worth upwards of one hundred guineas; whereas formerly none were brought

“brought to market that sold for more than thirty; and those chiefly
 “coach-horses. Adopt this simple idea with respect to mankind. Offer
 “premiums and bounties, under certain conditions, for the encourage-
 “ment of Arts, Manufactures, and Commerce, boys and girls, men
 “and women, the young and the old, will be candidates for your
 “prizes. Begin with a bias in favour of the Polite Arts; exhibit the
 “productions of rising genius annually to attract public attention, to
 “enable you to carry on your plan by voluntary small subscriptions;
 “and then proceed to those more useful branches of Art and Manu-
 “factures, which are extensively beneficial in a commercial country.”

Crowned with success, to this Society the ROYAL ACADEMY owed its origin; for without it, they could have had scarcely any young pupils, and but few Professors. Now, this patriotic Society makes the Polite Arts but a secondary object, while it promotes Agriculture, Mechanics, Manufactures, Chemistry, which includes Dyeing, &c. &c. &c. and boasts of a Prince of the Royal Family, a long train of Nobility, Gentry, and Citizens, in its list of Voluntary Subscribers. The meeting of a few intelligent well-disposed individuals has produced the HUMANE and MEDICAL Societies; and that great discovery in Optics, the *Acromatic* glasses, was entirely owing to three or four ingenious men assembling at a public-house in Spitalfields to amuse themselves in friendly conversation upon mathematical and mechanical subjects. As their numbers increased, so did the respectability of their members. *Mr. Canton*, *Mr. Nairne*, and *Mr. Dollond*, father of the present eminent Optician, became associates; and by the indefatigable industry and superior talents of *Dollond senior*, whose chief delight was in the study of Sir ISAAC NEWTON on colours, the valuable discovery abovementioned was brought to its present perfection.

Let us then indulge the pleasing hope, that similar success will attend the great design we have formed for the public benefit: the association is already set on foot; and the present patrons invite all persons of every rank to assist them, by their communications or in every other way they shall judge to be useful; always remembering, that it is in order to improve and strengthen the WOODEN WALLS of OLD ENGLAND, the best FORTIFICATIONS of the British Isles, that we solicit their contributions.

We wish to make the study of the *Mechanism of Floating Bodies* a subject of national attention, and to engage skilful mathematicians and mechanics to assist us with their labours.

If hereafter it shall be found that the poorer classes of workmen in any of the Yards stand in need of pecuniary rewards for their experiments or observations communicated to and approved of by our infant Society, they make no doubt of having funds to enable them to hold forth such encouragement to deserving men. That numerous, respectable, and most valuable corps of British Officers, the Lieutenants of the ROYAL NAVY who are held in the highest esteem in all the maritime countries of the known world, as well as in their own; and of whom an able French Minister of their Marine made the following just remark, “That they are the chief support of that wonderful superiority which the British fleets maintain at sea;” are particularly requested

to bestow some of those leisure days and weeks which a time of profound peace allows them, in examining carefully the hints, proposals, and plans which we have already in hand, to be laid before the public in regular order, without delay, for considerable improvement in the Art of Ship-building and Navigation; and to suggest any others that may occur to them. They are the best judges of the advantages to be derived from the facility of manœuvring Ships in time of action, and of the comparative excellence between one vessel and another in sailing.

It is asserted, that the French possess superior skill in this noble art, and that they stand indebted for it to their Academies instituted for the study of the Naval Sciences, and to the numerous ingenious authors who have been encouraged by their Government to publish treatises upon these important subjects. The obstructions that have hitherto prevented a general attention to this great national object, and have retarded improvements in the naval department, while we have been making rapid advances to perfection in many other branches of useful science, shall be candidly stated, and the remedy pointed out,

N U M B E R I.

IN the investigation of every branch of Human Science, it is incumbent on the impartial Enquirer, who professes to make Truth, Elucidation, and Improvement, the grand objects of his researches, to set out with an unequivocal declaration of the principles upon which he means to proceed. Without further preface then, we beg leave to state the following facts.

The extensive circulation of the *Introduction* to these Papers in the EUROPEAN MAGAZINE, in addition to the hints previously given of our general design, has produced a considerable increase of benevolent Correspondents; all of them expressing their hearty approbation of our plan, and most of them, particularly those who reside in the principal *sea-port* towns of the kingdom, promising their assistance. After a careful examination of their respective communications, we are authorized, by the concurrent opinions of professional men of undoubted abilities, and established reputation in the naval department, to advance these uncontroverted principles.

1. " That the Theory of Naval Architecture has not been paid
" that attention to in *Great Britain*, which so great a national
" object requires.

2. " That the causes, by due attention, and accurate investigation,
" may be fairly and fully ascertained.

3. " That in a nation so fertile as *Great Britain* in men of genius,
" and where the most skilful and industrious workmen are always to
" be found, and the best materials to be procured, nothing but public
" encouragement can be wanting to produce the remedy, and to en-
" able us to excel, not only our neighbours the French, but all
" other maritime countries, in constructing SHIPS OF WAR and
" MERCHANTMEN.

4. " That the French, *at present*, actually surpass us in this noble
" Art, and have derived many advantages from this superiority in
" times of war."

These

These are the premises upon which our extensive plan, and the future national INSTITUTIONS which may be expected to arise from it, will be founded, and, we trust, meet with public encouragement adequate to the laudable spirit which has set it on foot, and to the magnitude of the object.

It may be a difficult question to solve, whether the PLOUGH or the SHIP be the most useful machine in a maritime country so situated as Great Britain, where the protection of *Agriculture*, the *parent art*, and the benefits accruing from it, must depend on its *offspring* NAVIGATION; yet, while, on the one hand, we behold with pleasure the great improvements made in the former within the last half century, we have to lament, on the other, that little or nothing has been done to promote and encourage new discoveries and capital improvements in NAVAL ARCHITECTURE.

The bare inspection of the repository of the Society for the Encouragement of ARTS, MANUFACTURES, and COMMERCE in the Adelphi, London, and a perusal of the volumes of the Transactions of that patriotic Society, will demonstrate the considerable advantages the husbandmen of this kingdom have derived from the invention of new, and the improvement of old instruments of husbandry of various kinds, from the PLOUGH to the HOE. Many excellent treatises have likewise been written and published by our countrymen of late years, which have greatly contributed to the present flourishing state of agriculture in Britain.

CIVIL ARCHITECTURE has likewise employed the thoughts and the pens of men of abilities, and we every day see edifices erected, according to the improved rules of art, collected from various books on the subject, in our own language, in which regularity, order, durability, and ornament, are found to be carried to a high degree of perfection, from the *cottage* to the sumptuous *palace*. To what then are we to attribute the neglect of that important subject *Naval Construction*, but to the want, amongst other causes which shall hereafter be pointed out, of a generous concern for, and close attention to it, by men of science, and of practical knowledge; and to the paucity of good authorities to be consulted; for we have but few English authors of any repute upon the subject.

Let us then hope that the time is come, when men of genius in this line will attempt the very difficult, but most laudable task, of uniting *Theory* with *Practice*, especially when they reflect on the great national object in view, the better construction of ships for the defence of their native country; and for the security and prosperity of its extensive commerce.

And now, having pointed out one principal deficiency, we will endeavour to apply the remedy in this paper, before we proceed to any other. This we imagine cannot be more effectually accomplished than by reprinting an accurate catalogue of our little *nautical Library*; with the addition of the valuable list of English and Foreign Books communicated by our respectable correspondent Captain MULLER, whose interesting letter, as it contains his judicious remarks on them, is subjoined.

BOOKS on the ART of SHIP-BUILDING, collected by Mr. SEWELL, and ready for the inspection of the Patrons and Friends of our Plan.

ENGLISH AUTHORS.

1. NAVAL ARCHITECTURE: or, The Rudiments and Rules of Ship-Building, exemplified in a Series of Draughts and Plans. With Observations tending to the further Improvement of that important Art. Dedicated, by Permission to his Majesty, by Marmaduke Stalkaartt. 6l. 6s.
2. A Naval Expofitor; fhewing and explaining the Words and Terms of Art belonging to the Parts, Qualities, and Proportions of Building, Rigging, Furnifhing, and Fitting a Ship for Sea; alfo all Species that are received in the Magazines, and on what Services they are ufed and ifued. Together with the Titles of all the inferior Officers belonging to a Ship, with an Abridgment of the refpective Duties. By Thomas Riley Blankley, 4to. 1l. 1s.
3. A Treatife on Ship-building and Navigation. By Mungo Murray, Shipwright of his Majesty's Dock-yard, Deptford, 4to. 1l. 6s.
4. The Manœuverer, or Skilful Seaman; being an Effay on the Theory and Practice of the various Movements of a Ship at Sea, as well as naval Evolutions in general. Tranflated from the French of M. Bourde de Villehues, by the Chevalier de Saufeuil, with 13 Copper-plates. Dedicated to Prince William Henry, 4to. 1l. 1s.
5. The Ship-BUILDER'S Affiftant, or Marine Architecture: Containing, 1. Decimals, Extraction of the Roots, Geometry, and Menfuration, with Rules for finding the Contents of Plank and Timber; alfo the Tonnage of Ships. 2. Observations on the Nature and Value of Timber, and how to procure it of the neceffary forms. 3. Method of drawing Plans of Ships and Moulding the Timbers, with practical Rules to be obferved in building the Hulls of different Ships. To which is added, the Scantlings or Dimensions of Ship Timber. 4. Directions for making Masts and Yards in juft Proportion to the Ship and to each other; alfo Tables of the Weights and Sizes of Anchors and Cables, according to the new Eftablifhment. 5. The Boatfswain's Art, fhewing the Length and Thicknefs of each Rope; alfo Cable and Cordage Tables, fhewing by Infpection the Weight of any Rope, with Directions for cutting out Sails. By William Sutherland, Shipwright and Mariner. 5s.
6. A Complete Theory of the Conftruction and Properties of Veffels; with practical Conclufions for the Management of Ships made eafy to Navigators. Tranflated from the French of the celebrated Leonhard Euler, by Henry Watfon, Esq. 6s.
7. The Ship Builder's Repository; or, A Treatife on Marine Architecture: Wherein are contained the Principles of the Art, with the Theory and practical Parts fully explained, and every Inftruction required in the Building and Completing a Ship of every Clafs, from the Forming of the Draught to the Launching into the Water. Calculated to the Capacity of Young Beginners. Compiled and digefted in a Manner entirely new, and laid down different from what has hitherto appeared on the Subject. The Whole being intended as a Complete Companion for thofe Naval Architects defirous of attaining a Complete Knowledge of that important Art. 1l. 1s.
8. Abstract on the Mechanifm of the Motion of Floating Bodies. By M. De La Croix, Commiffary General of the Marine, &c. &c. Tranflated from the French, and published by Admiral Knowles, and now re-printed. 1s. 6d.—
“This little Treatife contains more knowledge in the art of fhip-building than any book hitherto published, that I have met with. The principles the author proceeds upon are juft and true; I have verified them by a number of experiments, and they agree exactly with the calculations he gives; but what proved moft fatisfactory to me, was their answering perfectly well, when put into practice, in feveral line of battle fhips and frigates that I built whilft I was in Ruffia.
CHARLES KNOWLES.”
9. An Universal Dictionary of the Marine; or, A Copious Explanation of the Technical Terms and Phrafes employed in the Conftruction, Equipment, Furniture, Machinery, Movements, and Military Operations of a Ship. Illustrated with

with a Variety of Original Designs of Shipping, in different Situations; together with separate Views of their Masts, Sails, Yards, and Rigging. To which is annexed, a Translation of the French Sea Terms and Phrases; collected from the Works of Messrs. Du Hamel, Aubin, Saverion, &c. By William Falconer, Author of the Shipwreck. 4th Edit. 1l. 4s.

10. A general View of the Dimensions of the most approved Ships of each Class in the British Navy, with the exact Dimensions of their Masts, Yards, Rigging, Blocks, Guns, Gun Carriages, Anchors and Cables, according to the Establishment of 1778. 3s.

11. A new Edition, with the Author's last Additions and Corrections, of Mr. Ludlam's Description and Use of Hadley's Quadrant.

12. An Introduction and Notes on M. Bird's Method of dividing Astronomical Instruments. To which is added, a Vocabulary of English and French Technical Terms. By William Ludlam, late Fellow of St. John's Cambridge. 2s.

13. The Ship-Master's Assistant, and Owner's Manual. Containing complete Information for Merchants, Owners, Masters of Ships, and Officers in the Royal Navy, relative to mercantile and maritime Laws and Customs. In the Course of which the following Subjects are particularly elucidated:—1. Disbursements, and other Ship-Accounts. 2. Tables useful in Maritime Affairs. 3. Freight. 4. Charter-Parties. 5. Demurrage. 6. Insurance. 7. Bottomry. 8. Salvage. 9. Averages. 10. Privateers. 11. Quarantine. 12. Bills of Exchange. 13. Navigation-Act. 14. Smuggling-Acts. 15. Acts for Indemnifying Owners. 16. Manifest-Act. 17. Fisheries in the Greenland Seas and Davis's-Streights. 18. Southern Whale Fishery. 19. British Fisheries. 20. Newfoundland Fisheries. 21. Impressing. 22. Slave-Trade. 23. Duty of Masters and Mariners, &c. &c. The Whole compiled from undoubted Authority, and the Acts of Parliament faithfully abridged. By a Gentleman of the Inner Temple. Sewed. 5s.

14. Hutchinson's Treatise on Practical Seamanship, with new and important Hints and Remarks relating thereto. Designed to contribute something towards fixing Rules, upon philosophical and rational Principles, for the Form, Proportion and Dimensions in Length, Breadth, and Depth of Merchant Ships in general, and the Management of them, &c. Second Edition, enlarged, 4to. 15s.

FRENCH AUTHORS.

1. *TRAITE de la Construction des Vaisseaux, avec des Eclaircissements et Demonstrations touchant l'Ouvrage intitulé Architectura Navalis Mercatoria, &c.* Par Frederic Henri de Chapman, Chevalier de L'Ordre Royal de L'Epée, Premier Constructeur des Armées Navales, et de L'Academie Royale de Stockholme. Traduit de Suedois, 4to. Paris, 1781. 1l. 1s.—We have in our possession one copy of the 62 Draughts of the above ingenious Author, for the Inspection of the Public.

2. *Elemens de L'Architecture Navale, ou, Traité Pratique de la Construction des Vaisseaux.* Par M. Du Hamel de Monceau. Seconde Edition, 4to. Paris, 1758.

3. *Traité du Navire, de sa Construction, et de ses Mouvements.* Par M. Bouguer, de L'Academie Royale des Sciences, ci-devant Hydrographe du Roy au Port du Croisac, et au Havre de Grace, 4to. Paris, 1746. 1l. 1s.

4. *Essai Geometrique et Pratique sur L'Architecture Navale, à l'Usage des Gens de Mer.* Par M. Vial du Clairbois. 1 vol. large 8vo. Paris, 1776. 12s.

5. *De la Manœuvre des Vaisseaux, ou, Traité de Mechanique, et de Dynamique; dans lequel on reduit à des Solutions tres simples les Problemes de Marine les plus difficiles qui ont pour Object le Mouvement du Navire.* Par M. Bouguer.

6. *Vocabulaire des Termes de Marine Anglois et François.* Par M. Lescahier, 8vo.

7. *Cours de Mathematique, à l'Usage des Gardes du Pavillon, et de la Marine.* Par M. Bezout, de L'Academie Royale des Sciences, et celle de Marin, 6 vols. 8vo.

COPY OF CAPTAIN MULLER'S LETTER TO M^r. SEWELL.

S I R,

IN an advertisement annexed to the Monthly Review for December 1789, I find an invitation to communicate either to you, or a gentleman of your acquaintance, supplements to a Catalogue of Books relating to the important art of Ship-building; and though I am an entire stranger to you, I fancy myself able to send you one, which I do by this; hoping you will find it worth, at least, the postage: That I should not make you pay, if I did know any means to send you this letter entirely post paid; but that being an impossibility, I have no other apology for doing it, than your own offer to pay the expences of any similar information.—The many faults against the rules of the English language you will kindly pardon, as it is a German that writes to you.

I begin without any farther prologue, with some literary notices of some of the books mentioned in your Foreign Catalogue.

No. 1, *French Authors*. “*Traité de la Constr. d. V. 4to. Paris 1781.*”—There is another French translation of the same book in folio, whose title is, “*Traité de la Constr. d. V. avec une Explication où l'on démontre les Principes de L'Arch. Nav. Marchande et des Navires Armés en course, par M. Fred. de Chapman, &c. Trad. du Suedois, sur l' Edit. publ. et impr. chez Jean Pfeiffer en 1775. A Paris, chez Saillant et Nyon, Libraires, et la Veuve Desaint, Libraire, Rue du Foin St. Jaques, 1779.*”—This last-mentioned translation is not worth the paper spoiled by it, as the Translator is an entire stranger to the French and Swedish technical terms of Ship-building. He follows the original *verbatim*, and translates many technical terms in the same manner as if somebody would translate the English word *vineyard* in Latin by *aula vini*; so that this translation might, perhaps, be much easier understood by a Swede, than by any person versed in the French Language. The translation you mention is still more eminent above the last mentioned, mentioned only to give a warning against it. The first is still more valuable by the very ingenious and skilful notes of the Translator, though he leaves a *desiderandum*, that he might have followed his original more strictly without any omissions. The notes of M. Vial du C. are translated into the Swedish language under the following title, “*Vial du Clairbois Anmerkningar, vid Chapman's Tractat om Skeps-Byggeriet, ofversatte af M. A. Norberg. Stockholm. 1782.*”

No. 2, *F. A.* “*Elemens d'Arch. Nav. Par Du Hamel de Monceau, Paris 1758.*” The first edition is of 1752, and was translated at St. Gravenhage and Amsterdam, by Otho Van Thol and Gerrit de Groot, in the year 1759, in 4to. under the following title: “*Grondbeginfelen van den Sheepsbouw of werkdadige Verhandeling der Sheepstimmerkunst; in't Fransch beschreeven door den Heer Du Hamel de Monceau, &c. en in het neederduits gebracht door* “ een

“ een Liefhebber der vrye Kunsten. Synde deeze vertaaling onder
 “ het opzigt van twee beroemde Hollandsche Scheepsbouwers
 “ verrykt met eenige aantekeningen voor ongeoeffende in de
 “ Fransche Scheepstimmerkunst en in de Meetkunde.” The
 annotations are few, and not of very high value, though not
 entirely superfluous; in the French “ *Encyclopedie Marine*,” there
 are much more valuable. A German translation will come out
 this or next year at Berlin, for the bookseller Joachim Pauli, and
 the Translator promises to add the most necessary rules for the
 construction of merchant-ships. In the year 1780, or 81, a new
 French edition was advertised to be published at Paris, by the
 bookseller Jombert Jeune. I never afterwards heard of it, so that I am
 not certain if it really came out.

No. 3, *French Authors*. There appeared lately another book of the
 same author, whose title is, “ *Traité Elementaire de la Construction*
 “ *des Vaisseaux à l'Usage des Eleves de la Marine, composé et publié*
 “ *par ordre de Mons. le Marechal de Castries, Ministre et*
 “ *Secrétaire d'Etat au Departement de la Marine, par M. Vial*
 “ *du Clairbois, Ingenieur Constructeur ord. de la Marine, de*
 “ *plusieurs Academies. A Paris, chez Cloufier, Imprimeur du*
 “ *Roi, Rue de Sorbonne, 1787. 4to. (bound, 13 livres).*” The
 book is very good, like every other I have seen of the same skilful
 author, who seems to me to be the most skilful French constructor
 at present, by theory and practice.

Of English books I do not notice earlier editions, as I suppose
 them known to you.

No. 4, *English Authors*. The French original came out in 1765, and
 there is a Dutch translation of it under the title, “ *De Scheepsbestier-*
 “ *der,*” that came out in 1768, at Dordrecht, by Abraham Blasse, book-
 seller. Among other books of this sort relating to the Manœuvring of
 Ships (not Sea Tactics in particular), the two following seem to me
 to be principal ones: “ *Exercice general de toutes les Manœuvres qui*
 “ *se font à la Mer dans toutes les occasions qui se peuvent présenter,*
 “ *par M. le Chev. de Tourville;*” and, “ *La Theorie de la*
 “ *Manœuvre des Vaisseaux reduite en Pratique, ou les Principes*
 “ *pour naviguer le plus avantageusement qu'il est possible. Par M. Pitot.*
 “ *Paris, chez Claude Jombert, 1731. 4to. (12 livres de France);*” and
 the newest that came to my notice is a Swedish one, that I know by
 authority of a good German Journal called “ *Die Allgemeine*
 “ *Litteratur zeitung von Jena,*” has the title “ *Forfök til el kost ut*
 “ *kast om sjö Manoevren. Stockholm, for Holmberg, 1787.*” The
 author's name is David Sjöbohm.

No. 5, *E. A.* The same author has given out another work: an
 abridgement of the title is, “ *Britain's Glory, or Ship-building*
 “ *unveiled, being a general Director for Building and Completing*
 “ *the said Machines. By William Sutherland, Author of the*
 “ *Ship-builder's Assistant. The Second Edit. For A. Bettsworth,*
 “ *at the Red Lion, Pater-noster-row; S. Litzer, in the Minories;*
 “ *E. Midwinter, at the Looking-Glass on London-Bridge, 1729. fol.*”
 As it is an English work, I only remark, that it is not quite so
 obsolet

obsolete as it seems to be; and there will be found at least in it, good models for contracts of every kind relating to Ship-building, which I never met with in any other book.

No. 6, *English Authors*. This book is translated into almost every European language, and is a kind of an abridgement of a more extensive work of the same author, whose title is, "Leonh. Euleri Scientia "Navalis. 2 Partes. Petropoli 1749. 4to." Another very valuable book of almost the same kind is Spanish, and I know it only by a French translation, whose title is, "Examen Maritime "Theorique et Pratique, ou Traité de Mecanique appliqué à la "Construction et à la Manœuvre des Vaisseaux et autres Batimens, "par Dom George Juan, Commandeur d'Alinga dans l'Ordre de "Malthe, Chef d'Ecadre d. Arm. Nav. d. S. M. Cathol. &c. "Traduit de l'Espagnol par M. Levêque, Ingenieur Hydrographe, " &c. 2. Vol. 4to. maj. Paris, chez Didot, 1785." The original came out in 1772 or 73. This is a capital book.

No. 9, *E. A.* The most complete book of this kind, that contains articles of every art and science belonging to all parts and branches of the nautical knowledge, is that part of the French *Encyclopedie-Methodique: Marine*. There are out at present two volumes, and a part of the third, and one volume of copper-plates; and, guessing by the proportion of what is already printed (I saw it only till page 320 of the third volume, and the article *Reglement*), the fourth volume will finish it. M. Vial du Clairbois is one of the editors, and in the different articles of it you find very ample abridgements, and in many places entire re-impressions of the best French authors. So it contains almost No. 1. and 2. of your *French Authors* entirely, and No. 2. with very good correcting notes. This book alone will do good for the little *Bibliothèque Portative* of any Sea-Officer; and its only fault for any man that does not belong to the French navy is, that every thing respecting the French service in the navy is copied from the many French *Reglemens*, old and new, abolished and yet in use, to an almost tedious extent: but this, perhaps, may be a quality that renders it the more recommendable to the French Officer, for whose use it was calculated originally. In the plates too, there is a most extravagant profuseness; and you will find, for many things that might have been explained at the same figure with the greatest ease, many reiterated representations. I do not mention other works of this kind, *e. g.* the old "English Seaman's Dictionary, by Sir Henry Manwayring, London 1670." Aubin, Saverien, Desroches, &c. &c. as they are almost known to every body. I only find it necessary to warn you of a German book of the same kind, whose title is, "Erläuterungen zum Verstande der Schifffahrt und des "Seekrieges nach alphabetischer ordnung, durch der Herausgeber "der Kriegsbibliothek. Breslau bey Korn, 1779, 8vo." which is very far from being tolerably *mediocre*.

As the other books, especially Nos. 11, 12, 13. *E. A.* do not belong strictly to this branch of the naval science, I have nothing to say, and nothing to add respecting them, as I confine myself only to books relating to the general theory and the practice of Ship-building.

In respect to No. 4. of the *French Authors*, I forgot to acquaint you, that I found some time ago in the *Journal des Scavans* for March 1788, the following notice, occasioned by a review of the mentioned 4to. book of M. Vial du Clairbois, entitled, "Traité Elementaire, à l'Usage des Eleves de la Marine. L'Auteur a fait un Traité encore plus étendu pour la Collection des Arts de l'Academie des Sciences, et qui ne laissera rien à desirer. Il s'est servi de plusieurs excellens Dessins qui lui ont été fournis par M. de Guy Sous-Ingen. Constr. &c." Some of these are likewise in the 4to. Traité Elementaire, and very instructing, in particular for the iron-work in bolting, &c. hitherto almost entirely neglected in every book of this kind. I have nothing more to say about your Catalogue, than that some books of it were entirely new to me.

Now to other books not mentioned in your Catalogue, with a short notice of what I know about them; and if there is nothing to add, you may take it as a sign that I never saw the book, but found it mentioned only by an author whose name you will find alleged.

ENGLISH BOOKS.

Cornelis Van Yk, a celebrated Dutch author, whose book shall be mentioned among the Dutch authors; *allegates* two English books,

1. The Complete Modellist, without the name of the author; and
2. Samuel Pepys' Architectura Navalis.
3. Marine Architecture, or Directions for Building and Rigging of a Ship, from the laying of her Keel to her actual going to Sea. London, Printed for W. and J. Mount and T. Page, on Tower-Hill.—Year and form unknown to me.
4. Principles of Naval Architecture, with Proposals for Improving the Form of Ships. To which are added, Some Observations on the Structure of Carriages for the Purpose of Inland Commerce, Agriculture, &c. By Thomas Gordon, Esq. London, Sold by Tho. Evans, Pater-Noster Row, 1789. 8vo. —Some of this author's projects seem practicable, others almost as fanciful as some of Dr. Franklin's proposals in his sundry Maritime Observations in the 2d Volume of the Transactions of the American Philosophical Society.

FRENCH BOOKS.

1. Construction des Vaisseaux du Roi, et le nom de toutes les Pieces qui y entrent Marques en la Table, avec toutes Proportions de Rangs, leur Explication et l'Exercise du Canon. Au Havre de Grace, 1691.
2. L'Architecture Navale. Par le Sr. Daffié. A Paris, 1677. 4to. (or 1676.) —I found it alleged with this remark: "Cet ouvrage contient des details qu'on ne trouve point ailleurs, mais il est fait avec bien de la negligence." —I never had occasion to see it.
3. Theorie de la Construction des Vaisseaux. Par Paul Hoste. Lyon, 1697. fol —I saw it several times in collections of books, but do not remember to have read in it.
4. L'Art de batir les Vaisseaux et d'en perfectionner la Construction, de les garnir de leurs Appareux, les mettre en Funin, les Manœuvrer, &c. Avec la Coupe d'un Vaisseau du premier Rang, les devis de plusieurs sortes de Vaisseaux, les Outils et Machines des Ateliers, de Construction les Instrumens de Mathematique servans à la Navigation; leur Descriptions et Figures; diverses Listes et Tables concernant la Construction, l'Equipment, &c. outre les Pavillons de divers Etats. Le Tout tiré des meilleurs Auteurs Hollandois, comme Witsen, Van Eyck & Allard. 2. Tom. A Amsterdam, chez David Mortier, 1719. 4to. —The second volume has the following title: Les Pavillons ou Bannieres que la plupart des Nations arborent en Mer comme font ceux d'Angleterre

d'Angleterre, d'Ecosse, d'Irlande, des Provinces Unies, des Pays Bas, de l'Espagne, du Portugal, d'Italie de France, du Dannemarc, de la Suede, de la Pologne, de Prusse, d'Allemagne, de Moscovie, de Turquie, de Barbarie, et des Indes Orientales, &c. Tome II. A Amsterdam, chez D. Mortier, 1718. —This work seems to owe its existence to the great many plates and cuts that remained with the booksellers without any use after the books they belonged to originally were printed. The second part aids to sell the first, which does not contain any thing particular that could not be found in similar works, better and more complete. In truth, this book should be reckoned rather among the Dutch than the French authors.

5. Instruction Élémentaire et Raisonnée sur la Construction pratique des Vaisseaux en Forme de Dictionnaire, Ouvrage publié par Ordre de Mons. De-Boynes, Secrétaire d'Etat ayant le Département de la Marine. Par M. Duranti de Lironcourt, Enseigne des Vaisseaux du Roi. A Paris, chez F. B. Mefier, Fils, Libraire, Quay des Augustins, 1771.—Very clear as far as may be without prints; but it seems to be not very complete, though not very defective, and always very useful for young beginners.

DUTCH BOOKS.

1. De Aeloude en heedendaegsche Scheepsbouw en heftier, waarin wydtloopig wert verhandelt de wyze van Scheepstimmeren by Grieken en Romeynen; Scheepsoeffeningen, sryden Tucht, straffe Wetten en Gewoonten beneffens evenmatige grootheden van de Schepen onses tydts ontleit in alle-haare deelen: Verschil van bouwen tusschen Uitheemschen en onzen Landaart: Indisch Vaertuygh; Galley bouw; heedendaegsche Scheepsplichten vererryckt met een reek verklaerde Zeemans Spreekwoorden en benaamingen. Doorgaans verciert met veel kopere platen, beschreven door Nicolaus Witsen. J'Amsterdam, by Casparus Commelyn, Broer en Jan Appellaer, Boekverkoopers, Ao. 1671. fol. (9 Dutch Florins).—A great deal of antiquity and literary knowledge diffused on many things, of which we know little more than nothing, and entirely destitute of use: of modern Ship-building, nothing almost that may be of use in our days, but only to shew how faithful the Dutch are yet to many customs of their ancestors.

2. De Neederlandsche Scheepsbouw-konstopengesteld, vertoonende naar wat Regel of Evenredenhyt in Neederlandsche meestalle Scheepen werdengebouwd, mitsgaders Masten, Zeylen, Ankers en Touwen enz daarnaa gepast. Soo uit de Schriften van ouder als jonger Bouwmeesters als ook by eygen ondervindinge tot nut van alle jonge Bouwmeesters in Knechten als ook Uytreeders en Liefhebbers van Scheepen t' samen gestelt door Cornelis Van Yk, Scheepstimmerman. Met kopere Figuren ter materie dienendevererryckt. Gedruckt by Andrier Voorstad tot Delft. voor Jan ten Hoorn Boekverkooper tot Amsterdam over't oude Heeren Logement, 1697. fol.—Not so much antiquity as the former, though the author begins with the Ark of Noë. All practical, almost no theory; dimensions, and assembling of singular pieces of ships, all in the old Dutch strong, and in England commonly called clumsy manner.

3. De Nieuwe Hollandsche Scheepsbouw door Carel Allard. 2. Deelen. Amsterdam, 1705.—I have seen it in different collections, but never had occasion to peruse it.

4. Verhandeling van den Hollandschen Scheepsbouw raakende de verschillende Charters der Oorlogscheepen tot S'Lands Dienst en ter beachtinge van alle bespiegelnde en werkdadige Liefhebberen der Hollandsche Scheepsbouwkunde in't neederduits beschreeven dor L. Van Zwyndregt, Scheepsbouwmeester, van't Ed. mog. Admir. Coll. aan de Maaze. Waerby tot een aan hangsel gevoegd is een verhandeling van't bouwen der Koopvaardy Scheepen door C. de Ruiter, Scheepsbouwer. In's Gravenhage, by P. de Hondt en H. Scheurlier, 1757. 4to.—This little book contains an apology for what foreigners call the Dutch clumsy way of Ship-building, by allegation of the qualities of their ports, &c. and dimensions of ships and timber. The Appendix, though no more than twenty pages (the whole book contains 126), seems to be the highest effort of the Author's skill; and his pretext for not saying more, viz. that the master shall always keep his best trick for himself, excites pity.

5. A very particular enquiry of the best form of Ships for the Indian trade, of 140—156 feet length, is inserted in the *Verhandelingen uitgegeeven van't zeeuwisch Genootschap der Wetenschappen te Vlissingen*. Middleburg 1788. Tom. VII. 1st Section, No. 3. & 4.—The names of the authors are Lombard and Udemann, and their memoirs were written by occasion of a prize put upon the answering the said question.

ITALIAN AUTHORS.

I found alleged a work of Naval Architecture in a book of the last century, written by Bartholomeo Crescentio di Roma; and another *Architectura Nautica* di Vasconcelli, that came out at Firenze, 16 .

PORTUGUESE AUTHORS.

Elementos de Construcção e Dicionario Francez e Portuguez de todas as peffas de que se formao os Navios, que dedicou ao Illm. e Exm. Senhor D. Pedro Joseph de Noronha e Camoes, Marquis e Senhor das Villas de Angeja, &c. Pedro de Mariz de Sousa Sarmento Fidalgo Cavall. da C. R. Capitaõ de Mar e Guerra, &c. Lisboa na Officina patriarcal de Francisco Luis Ameno, 8vo.—This little book merits mention, as the only one in its country. It is very defective, and admits to be more completed by its ownself, as the signification of many words may be guessed. For foreigners that trade to Lisbon, it is only remarkable for making themselves able to explain their wants in cases of necessity, &c. as no Portuguese dictionary has these terms.

GERMAN BOOKS.

1. Joseph Furttenbach's *Architectura Navalis*. Ulm. 1629. fol.—The greatest part contains explanations of the building of galleys and some inland vessels used on the Danube, and is only remarkable for old German terms of art. The author greatly follows Italian works, and many of his technical terms are Italian.

2. There is said to exist another old book of Ship-building, by a certain Fronsperger, who is renowned as one of the best authors (of his time) of the arts of war by land; but till present I could not get it under my reach.

3. *Daedalus, das ist neue Erfindungen zum Vorthail der Schiffahrt uber haupt, hauptsachlich aber auf der See von Christian Gottlieb Berger, der Arzneygelahrtheit Doctor mit 3 Kupfertafeln*. Berlin, by A. G. Lange, 1781.

4. *Vorschlage zur Vervollkomnerung der Schiffahrt den Seefahrenden Nationen gavidmet*. By the same Author. Berlin, 1787.—Two productions of the same author, and below all censure, as the author has not the least idea of the true form of a ship, neither by theory nor by practice. If it could be done without injuring the author, both could be called truly, a prostitution of common sense.

So far my collection of books relating to the whole art of Ship-building. Above, in mentioning *Euleri Scientia Navalis*, I forgot a similar book, relating to every part of Naval science, which is, “*L'Art de la Marine, par M. Romme*. A Rochelle 1787, or 88. 4to.”

Single parts of Naval Architecture are treated in the following books: I. The Art of Gauging. “*Le P. Pezenas Theorie et Pratique du Jaugeage*,” “*M. Mairan sur le Jaugeage des Vaisseaux*,” (insert. Mem. de l'Acad. des Scienc. de Paris de 1724, p. 231.) “*Memoire sur le Jaugeage des Navires, par M. Bellery, &c. 1788.*”—besides many English authors.—II. For the Mensuration of Timber. Four Books “*On the Improvement of Timber*,” a Memoir by Mr. Pallas, at Petersburg.—III. On Mastings. “*M. Camus sur l'Art de Mâture*,” “*Description de l'Art de la Mâture, par M. Romme, 1778,*” fol. &c. &c. &c.

I possess a similar collection of books of every branch and part of Naval Science, from Navigation to the regulations for different sea services;

services; and wished, if you or your correspondents should be curious to see it, to have or to get so much time as to send you a copy of it. I cannot get it copied by any body else, as my handwriting is very bad, and many of my annotations are made in a great hurry, and in different circumstances, that make it still more difficult to read them.

I shall find myself very happy if you get acquainted by this with some books that may aid to get at the task you proposed. I wish you may be less tired by reading than I am by writing this. If my long epistle contains nothing to reward you for the trouble you had in perusing it, you will, I hope, be so generous as to excuse my good will.

I remain, in due consideration, S I R,
Your most obedient Servant,
C. G. D. MULLER,

Captain and Commander of his British
Majesty's Electoral Guardship
stationed on the Elbe off Stade.

Stade, Feb. 9, 1790.

WE have only to add, that no time will be lost, nor any expence spared, to obtain the books recommended by Captain MULLER, or any others that may be hereafter pointed out to us by other Correspondents. And with the assistance of the present collection, we hope students in the art, Naval Officers, and other gentlemen inclined to devote part of their leisure-hours in time of peace to the service of their country, by the improvement of its marine, will be enabled to form a more accurate judgment of the deficiencies in our present *Naval Establishment* (a favourite term in the Yards), and of some plans already in our possession for considerable alterations and emendations, which will be laid before them in the following papers.

N U M B E R II.

FROM the high reputation in the Mathematical and Philosophical World of the Foreign Authors who have made the Theory of Naval Architecture so considerable a part of their studies as to publish those extensive Works which have been particularized in the CATALOGUE of FOREIGN BOOKS annexed to the preceding Number, it is sufficiently evident, that the Investigation of the Theory of Ships is a subject not only worthy the attention of the Mathematicians of our own country, but is also of such national importance that a Seminary ought to be established by Government, at one of our principal Royal Dock-Yards, expressly for the purpose of bringing-up young men in a course of mathematical studies*, together with a proper degree of practical knowledge, so as to render them able constructors of draughts for our men-of-war, which are now left to persons, however respectable in their respective

* "Le Cours de Mathematique de M. Bezant" is an excellent work, and written for the marine department.

situations, yet, from the line of their education, and necessary application to other objects of their profession, totally incapable of paying that arduous and unremitted attention to the higher branches of mathematics which is absolutely necessary to understand what has been already written upon, and much more to improve, so copious and abstruse a subject as the one alluded to. Many instances may, and hereafter will be, laid before the Public, how much even the present ships of the British Navy are indebted for the greater part of their best qualities to the labour of the Foreign Authors specified in the List above-mentioned: for the present paper, however, we shall content ourselves with inserting the following hints of an ingenious Correspondent, respecting the propriety of simplifying the Classes of our men of war.

When treating of ships of war, in the language of professional men, we ought to say that there are only six Classes or Rates in our present naval establishment. But if we extend our view to the whole service, so as to include all ships and vessels belonging to the Royal Navy, we must reckon twenty-four, from 110 to 8 guns, each wanting all their materials, tackle and furniture of different dimensions, which occasions great inconveniencies to the service; for large quantities of stores are sent to our foreign settlements both in the East and West Indies, there to spoil and rot, because the store-keepers, according to the *establishment*, dare not deliver out any article whatever, be the emergency ever so great, if it does not exactly belong to that class or rate for which it is wanted. The Officer who favoured us with the letter, a copy of which closes this paper, having lost his colours on the West India station, applied for others; but as there happened to be none in the store for the rate of his ship, he could not, by the rules of the *establishment*, be supplied with others, without express orders for that purpose from England.

Now, this and many other evils might be redressed by reducing the number of Classes in our navy; and in order to shew the expediency of such an alteration, we shall first give the rates of the present *establishment*, and then subjoin the very forcible reasons given by professional men for reducing the number.

RATES of the ROYAL NAVY.

- 1st, Ships mounting 100 Guns to 110.
- 2d, Ships mounting 90 Guns to 98.
- 3d, Ships mounting 64 Guns to 74.
- 4th, Ships mounting 50 Guns to 54.
- 5th, Ships mounting 32 Guns to 44.
- 6th, Ships mounting 20 Guns to 28.

S L O O P S.

From 10 Guns to 18.

Fire-ships and Bombs 8.

Cutters from 14 to 4 guns.

In the opinion of experienced Naval Officers, and of the most skilful Ship-Builders, our Navy ought not to consist of more than Four Classes, though some Officers are for adding a Fifth. According to either statement, there would be no occasion to send more than four Classes of Stores to our foreign arsenals.

The following are the two Statements proposed for a new Establishment.

N U M B E R I.

1. First Rates, 100 Guns.
2. Second Rates, large 74.
3. Third Rates, Frigates 36.
4. Fourth Rates, ditto 24.

N U M B E R II.

1. First Rates from 90 to 100 Guns.
2. Second Rates from 74 to 80.
3. Third Rates, 50.
4. Fourth Rates, Frigates 36.
5. Fifth Rates, ditto 24.

There is no difference of opinion respecting 64 gun ships being totally struck out of the rates. It is a fact, that our Naval Officers either *pray* or *swear* against being appointed to serve on board them; the reason for which we shall give in our Correspondent's own words:

"IT is well known that ships of 64 guns are *always* put into the line of battle, indeed sometimes ships of 50 guns; and it is also known that the French have few or no ships of that class; therefore to what disadvantage must our line fight when composed of a number of these ships, opposed to 74 and 80 gun ships, of which the French line is chiefly composed. *This is my reason* why no ships under a 74 gun ship should be built for the line of battle.

"A 36 gun frigate would be a match for any privateer that should dare attack her, and she would be also of a sufficient size to annoy a convoy of the enemy. All other frigates under this size are unworthy of the name of protectors of the British flag, as it is well known that there are many privateers fitted out of sufficient size and power to insult them.

"Some 24 gun ships might be built for the purpose of carrying dispatches; all others under this size are of too trifling a nature either to protect themselves or make any expedition in bad weather.

"Now, were we confined to these classes of ships, it is evident that there would be a great saving to the nation in the article of stores.—For instance, to every foreign arsenal a quantity of stores for all the present different rates of ships are sent out; and it is well known that near a half, if not quite, lie in the stores till they are quite decayed, because they are not applied for by the ships of the particular class for which they were designed.

"Now, if only these four classes of ships I have mentioned were to be built, it is evident that there would not be that amazing different sized stores that there is at present; for a 90 gun ship could upon occasion make a very good shift with a 74 gun ship's stores, and so could a frigate with a ship of 24 guns; and the only difficulty would be, if a ship of 24 guns was really distressed, and it was absolutely necessary to refit her, to reduce the 36 guns masts, yards, &c."

N U M B E R

N U M B E R III.

IN continuation of that division of our plan which is to treat of the Form and Size of Ships, we must here take notice, that an experienced LIEUTENANT of the ROYAL NAVY, tho' he perfectly agrees with our Correspondent, whose letter closed the last Number of our Original Papers in other respects, differs from him with regard to Ships of War of 50 guns : These he wishes to retain in the service, not as line-of-battle ships, tho' upon certain emergencies they might, and ought to be introduced into a fleet in that capacity, but as powerful single ships excellently well adapted to convey fleets of merchantmen in which service ships of that rate distinguished themselves in the last war : As there are at present but few of them, in proportion to the other rates, it may be sufficient to produce one instance.—The RENOWN, of 50 guns, a prime sailer, the Commander of which more than once received the thanks of our merchants for his services in protecting the commerce of his country home and outward-bound. Both of our Correspondents therefore concurring in one point, that the number of Classes in the Navy might be reduced, it remains to be determined by Officers who have been long in the service, and have experimentally found the advantages of employing 50 gun ships as convoys, and by impartial Masters of trading vessels, whether the proposed alteration marked No. II. in our last, which makes *five* Rates or Classes, by retaining fifty gun ships, or that marked No. I. reducing them to *four*, according to our Correspondents letter, merits the preference ; and any further information will be thankfully received, and communicated to the Public in some future paper.

Let us now, according to promise, investigate the Construction of ships of 44 guns.

The contracting of ships on their upper decks is certainly a very erroneous practice, as by this mode of construction, every wave, when such a ship goes on a side-wind (which may be the case nine days out of ten) is conducted in a greater or lesser degree upon the upper deck, thereby keeping the people continually wet. Nor is this the only consequence : It is on this deck that all the material business is done, and therefore more room should be given for working ; and the shrouds leading to the dead eyes would in that case have a greater base than they have at present, and would be much stronger ; neither could a ship be overset with double the wind or sea.

The smaller class of 70 gun ships, 64, 50, 44, being all of them built, according to the present establishment, with contracted upper decks, cannot open their lower deck ports, even in moderate weather. They are all too small, and have not sufficient bearings ; so that from these causes, and the ports upon their lower decks, though large, being only 4 feet 6 inches above the surface of the water, it is very unsafe at any time, and absolutely impossible to open them at all in a moderate breeze ; and thus they are by no means a match for a French ship of 36 guns in an engagement. Yet it is easily practicable to have them 6 feet out of the water,

B

when

when they might be opened against the enemy with the greatest safety at most times.

The CONQUEROR and the CORNWALL, old 74 gun ships, had sufficient bearings, and consequently were better sea-boats, and could open their lower deck ports almost in any weather.

Another cause of disasters to men of war is, the wrong construction of a Pipe which it has been judged necessary to introduce into them, in order to throw in a proper quantity of water, to mix with the *bilge water*, and which is pumped out again, to cleanse the ship, and free her from foul and noxious air. This Pipe, at present, is so badly contrived, that the working of the ship soon breaks it, and it is well known that the ROYAL GEORGE was obliged to have a new one after every cruize, which at last proved the cause of her dreadful catastrophe. By the assistance of skilful workmen, we hope to be enabled hereafter to present a new form of a pipe, to prevent the danger ships are exposed to from the breaking of these machines on the present construction; and not being as yet in possession of one which in every respect meets with the approbation of the gentlemen concerned in our patriotic institution, we must still solicit the favour of communications upon the subject from ingenious men.

An improvement in the Operation of the RUDDER has been suggested, sketches of which, with proper explanations, are preparing. In the mean time, we wish to shew an ardent desire to oblige all our Correspondents, by as early an insertion of their letters as the nature of our extensive plan will admit, due regard being paid to the arrangement of them, as they coincide with that division of our subject we may have under immediate consideration.

N U M B E R I V.

To Mr. SEWELL.

SIR,

IN your Address to the Public on the Cover of the EUROPEAN MAGAZINE of December last, you observed, "it is not an uncommon thing to find a Ship under Jury Masts make as quick a passage (nay sometimes quicker) as when full rigged," &c. &c.

I have lately read the Chevalier De SAUSEUIL's translation of M. BOURDE DE VILLEHUET's Naval Tactics. As he treats this subject not with that perspicuity necessary for my understanding, and in particular the following Problem, I beg leave to recommend it to the attention of your scientific Correspondents, in hopes that some of them will condescend to take the trouble of informing me, and other practical men, how we are to determine *the line of direction of the absolute impulse of the Sea on the Prow of a Ship (whose form is supposed to be known or given) in a direct course before the wind, in order to fix the point-velique.*—See his Book, p. 134.

An answer to this Problem may serve the Public, and greatly oblige,

Your's, &c.

B.

To

To Mr. SEWELL.

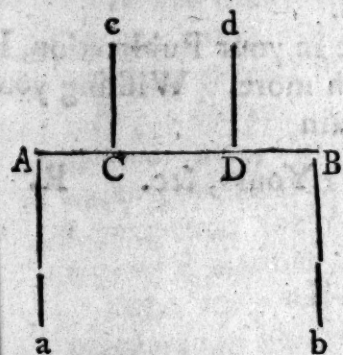
SIR,

YOU will, I trust, feel that satisfaction which accompanies conscious merit in receiving the hearty thanks of an individual (however obscure he may be) who has devoted twenty years to the study of Ship-Building, without being as yet able to make any satisfactory advance in the knowledge, and far less in the improvement, of that very useful Art. I sincerely offer you this acknowledgment of my gratitude for your publication and collection of Books on Ship-Building; and although few of them are new to me, yet the prospect of your being able to prevail with men of science to attend to the subject, has given me renovated hope that much will be done towards improvement in this liberal age; and this hope has tempted me to return to a study that I had relinquished as a fruitless pursuit. To accomplish the desirable purpose of improvement, few things can contribute more than a free and ready communication between men of science and practical men. With this view I send you the following, as part of the observations made in the course of reading two books in your List.

Mr. HUTCHINSON, in his "Essay on Practical Seamanship," page 11, points out long straight floors to be a defect in the construction of ships; and assigns this to be the principal cause of their "hogging and straining so soon and easily upwards."

From the form of arches, and the pressure they are capable of bearing, he concludes that a long straight floor is not so strong.

From the resistance of round or convex glass vessels, compared with straight or flat-sided ones, both being exposed to the pressure of the atmosphere by pumping the air out of them, and by comparing this with the pressure of the water on ships bottoms, he has drawn another conclusion unfavourable to long straight floors; and for what he has further said on this subject, and on the contrary effect, to sag downwards, see his book, page 11 to 19. What is said upon the efforts of the water to bend the vessel, in Mr. WATSON's Translation of Euler's "Theory of the Construction and Property of Vessels," see Book I. Chap. 3. pages 11 to 14.



Mr. EULER illustrates the state of the vessel, by comparing the action of the water upon the ship, and the re-action of the ship's weight, to a rod AB, acted upon by four forces Aa, Cc, Dd, Bb, which may be maintained in *equilibrio*, provided it has a sufficient degree of stiffness; but if not, its middle would obey the forces Cc, Dd, whilst its extremities would be drawn downwards as by the forces Aa, Bb, &c. &c. From Mr. EULER's reasoning, it appears to me that he thought it impracticable to give such a form to a ship as to secure against her hogging, otherwise than by adding to the strength proportionably to the strain; but as he has not ascertained the *quantum* of this additional strength, I hope some of your correspondents will take it under consideration.

I have a great respect for Mr. HUTCHINSON, as his Treatise affords many good practical observations; and it is sincerely wished that more of our judicious countrymen would follow his example, by making their practical remarks public. But, notwithstanding this, I think he has carried his idea of a long straight floor too far; the French ships have lengthways arched bottoms projecting downwards, but are more hogged than British-built ships; the Dutch, many Danish, and Hamburgh ships have long straight floors, and keep their sheers as well as any British ships.

From these observations the following Problems are submitted to the Public for investigation; and the writer hopes they will be not only of service to him, but also the Public in general and practitioners in particular.

1st. To ascertain the best form of a ship's floor, so as to be of the greatest possible strength to secure against hogging or sagging.

2d. To ascertain the just proportion of strength necessary for different forms of bottoms.

I think the following observations, if attended to, may be of service, and help to prevent hogging:

1st. That the strength of the keel and keelson be considerably increased, and that a false keelson be added.

2d. That all the timbers in a ship be framed and bolted together, and care taken that the floor timbers are sufficiently long.

3d. That the plank be thicker than is at present customary for bottoms, and of the greatest possible lengths; under light-water mark outside it may be of good English beech, or of oak from Canada, which last may be had in abundance of 50 feet long, and some upwards.

4th. That the shift of the inside plank be so disposed as to give proper shift to the outside plank, which is not sufficiently attended to in common practice.

5th. That all the decks be flush, and laid in a straight line lengthways, with indented strakes, according to the French fashion; and the planksheers flush fore and aft.

6th. A greater attention from Captains and Officers to the pillars under the beams than is at present shewn in merchant-ships, as well as to the stowing and unstowing of the cargoes.

If you think any part of this merits a place in your Publication, I will, upon a further occasion, trouble you with more. Wishing you every success in so great an undertaking, I remain

Yours, &c. R.

To Mr. SEWELL.

SIR,

London, April 21, 1790.

HAVING just perused a part of your plan for the Improvement of Naval Architecture, as it so exactly concurs with my ardent wishes on the subject, though but an obscure individual, I beg leave to tender
you

you my unfeigned thanks for the attempt. May success crown your endeavours! I rejoice at the happy dawn of improvement which is breaking forth; I anticipate the pleasure of being enabled to read the daily papers without the dread of seeing in every column the loss of my brave countrymen. The period is advancing when crossing the ocean will be rendered less hazardous and more expeditious, when billows will not molest, when tempests will not alarm. If the plan which you are so laudably engaged in should arrive at the degree of perfection every liberal mind must wish, it will be the employment of the patriotic few who undertake the arrangement, to select the probable from the chimerical, the solid from the superficial, and give the world a series of just principles, founded upon the firm united basis of practice, theory, and reason. Every projector, however apparently visionary his ideas may be, deserves attention. Perhaps more real improvements will be found to have originated from bold thinking, than from the slow progressive emendations of cautious timidity.

Probably, Sir, I shall obtain an answer from some of your ingenious Correspondents to the following question, *provided it merits the least attention.*

“Whether there be any difference in the velocity of a ship sailing in *salt water* and in *fresh*, with the same longitudinal impulse, and being of the same weight in both instances; and whether the same lateral impulse would equally affect the ship in both cases?”

I remain, Sir,

Yours, &c.

ACORN.

IN a future Number we are in hopes to present our Readers with the DRAUGHT of a very FAST-SAILING SLOOP, which from her form is far from having the appearance of a swift sailer, or a good sea-boat, although it is an incontrovertible fact, that this vessel has been chased in the English Channel by cruizers, and always escaped by her superiority in sailing. Our views in presenting this DRAUGHT are, to request the aid of men of science to account for those superior properties contrary to appearances.

OF the many disasters and miraculous escapes that happen at sea, few accounts come so well attested as that of the Guardian, we therefore extract the following passages as worthy remark.

Pages 10 and 11. “By the violence of the stroke had her rudder carried away, the tiller broke in two pieces, the after-beam of the upper gun deck in the middle, three of the planks raised about a foot higher than the deck, and the ship shook from stem to stern in so violent a manner that we expected her to part in every joint.”

Page 20. “Mr. Clements, and one watch, were accordingly employed in hoisting-up and heaving overboard, from abaft, whatever they could come at; and the others in working the pumps. Mr. Riou was employed occasionally, every where encouraging and animating the people as much as possible, for whose safety he shewed a concern that does him the highest honour. Many hours previous to this, he had privately declared to his officers, that he saw the final loss

of the ship was inevitable, and could not help regretting the loss of so many brave fellows:—"As for me," said he, "I have determined to remain in the ship, and shall endeavour to make my presence useful, as long as there is any occasion for it!"

"He was entreated, and even supplicated, to give up this fatal resolution, and try for safety in the boats. It was even hinted to him, how highly criminal it was to persevere in such a determination; but he was not to be moved by any entreaties—"If I was to be saved, and any of the crew lost," said he, "I should be for ever miserable. As Commander, I consider it, in the first place, my duty to look to the safety of my people, and then comes the consideration of my own. I will do my endeavours to effect them both, although I fear the impossibility. My opinion is fixed, and I hope none of my friends will again agitate my mind on the occasion."

"But to return to the sad conclusion of the narrative relative to the ship:—At seven o'clock she had filled considerably abaft, and the water was coming in at the rudder-case in great quantities. At about half past seven o'clock, the quantity of water in the hold obliged the people to break off from below, and come upon deck; the ship was very soon after found to be in a sinking state, and entirely given over for lost. At this time the water within board was nearly as high as the lower gun-deck, and the ship settling bodily down; it was therefore almost immediately agreed upon to have recourse to the boats.—While engaged in consultation on this melancholy business, Mr. Riou took a sheet of paper, and wrote a letter on his Majesty's service, to the Admiralty, which he delivered to Mr. Clements.

"He then ordered to get the boats hoisted out, and to endeavour to give as many a chance of safety as he could with propriety."

Page 39. "Jan. 6. At twelve A. M. made the land.

"Jan. 9. Blew a violent gale of wind, in which we were very near foundering.

"Jan. 18. At noon, anchored in Table Bay, Cape of Good Hope.

"The Guardian remained, in the hopeless state before described, for some days without a rudder, and wholly unmanageable:—but the application to reduce the water in her hold was assumed, whenever the weary crew felt the return of strength and power:—and thus was the vessel kept afloat till a Dutch packet-boat from the Spice Islands and Batavia, providentially steering a high *southerly* latitude, fell in with her, and, affording her aid of men and materials, enabled her to make good her way back to the Cape of Good Hope; and kept her company during her course.

"The ship's crew consisted of ninety-six men only, which, with a few officers, intended for the better regulation of the Settlement, together with convicts, who were skilful mechanics, made the total amount of souls 124; of these about SEVENTY remained with Lieutenant Riou to share his fate, among whom was the Hon. Mr. Pitt, son to Lord Camelford.

"After the ship was cleared of the live-stock, the tubs of earth in
which

which the trees and plants were preserved, her two guns, all she had, and every sort of useless lumber, were committed to the deep, her remaining cargo, it is thought, was the means, owing to its *buoyant* quality, of keeping the ship afloat.

“ The Guardian was EIGHT WEEKS, to a day, making the course of something less than 400 leagues, and in that time the crew were scarcely dry for an hour together !—An awning of sail-cloth extended over part of the quarter-deck, to afford occasional rest to the men in their short respites from duty.”

To this we shall subjoin the Opinions of Dr. FRANKLIN, in a Letter to ALPHONSUS LE ROY, extracted from the Second Volume of “ American Transactions,” 4to. as few of our readers may have seen that work, and we may have future occasion to refer to it.

“ One maritime observation more shall finish this letter. I have been a reader of newspapers now near seventy years, and I think few years pass without an account of some vessel met with at sea, with no soul living on board, and so many feet of water in her hold, which vessel has nevertheless been saved and brought into port : and when not met with at sea, such forsaken vessels have often come ashore on some coast. The crews who have taken to their boats, and thus abandoned such vessels, are sometimes met with and taken up at sea by other ships, sometimes reach a coast, and are sometimes never heard of. Those that give an account of quitting their vessels, generally say, that she sprung a leak, that they pumped for some time, that the water continued to rise upon them, and that, despairing to save her, they had quitted her, lest they should go down with her. It seems, by the event, that this fear was not always well founded, and I have endeavoured to guess at the reason of the people’s too hasty discouragement.

“ When a vessel springs a leak near her bottom, the water enters with all the force given by the weight of the column of water without, which force is in proportion to the difference of level between the water without and that within. It enters therefore with more force at first, and in greater quantity, than it can afterwards when the water within is higher. The bottom of the vessel too is narrower ; so that the same quantity of water coming into that narrow part, rises faster than when the space for it to flow in is larger. This helps to terrify. But as the quantity entering is less and less, as the surfaces without and within become more nearly equal in height, the pumps that could not keep the water from rising at first, might afterwards be able to prevent its rising higher, and the people might have remained on board in safety, without hazarding themselves in an open boat on the wide ocean.

“ Besides the greater equality in the height of the two surfaces, there may sometimes be other causes that retard the farther sinking of a leaky vessel. The rising water within may arrive at quantities of light wooden work, empty chests, and particularly empty water-casks, which, if fixed so as not to float themselves, may help to sustain her. Many bodies which compose a ship’s cargo may be specifically lighter

than water ; all these, when out of water, are an additional weight to that of the ship, and she is in proportion pressed deeper into the water ; but as soon as these bodies are immersed, they weigh no longer on the ship, but on the contrary, if fixed, they help to support her, in proportion as they are specifically lighter than the water. And it should be remembered, that the largest body of a ship may be so balanced in the water, that an ounce less or more of weight may leave her at the surface, or sink her to the bottom. There are also certain heavy cargoes, that, when the water gets at them, are continually dissolving, and thereby lightening the vessel, such as salt and sugar. And as to water-casks, mentioned above, since the quantity of them must be great in ships of war where the number of men consume a great deal of water every day, if it had been made a constant rule to bung them up as fast as they were emptied, and to dispose the empty casks in proper situations, I am persuaded that many ships which have been sunk in engagements, or have gone down afterwards, might, with the unhappy people, have been saved ; as well as many of those which in the last war foundered, and were never heard of. While on this topic of sinking, one cannot help recollecting the well-known practice of the Chinese, to divide the hold of a great ship into a number of separate chambers, by partitions tight caulked (of which you gave a model in your boat upon the Seine), so that if a leak should spring in one of them, the others are not affected by it ; and though that chamber should fill to a level with the sea, it would not be sufficient to sink the vessel. We have not imitated this practice. Some little disadvantage it might occasion in the stowage, is perhaps one reason ; though that I think might be more than compensated by an abatement in the insurance that would be reasonable, and by a higher price taken of passengers, who would rather prefer going in such a vessel. But our seafaring people are brave, despise danger, and reject such precautions of safety, being cowards only in one sense, that of *fearing to be thought afraid.*"

N U M B E R V.

A GENTLEMAN who anxiously wishes to have the Science of Navigation carried to as great a height as the Art is capable of attaining, begs leave to submit to the consideration of those scientific men who are desirous of bringing to perfection this most necessary branch of Mechanics, the following considerations, extracted from different Authors who have written on the subject.

1st. It has by many been allowed, that the present theory of "the resistance to bodies moving through a fluid," is exceedingly erroneous, unless their velocity be small ; in other words, that it is not true, that when a body moves through a fluid in the direction of its axis, the resistance it meets with will be in proportion to the square of the velocity ; neither will the resistance, when the same body is placed in an oblique direction to the shock of the fluid, be as the square of the angle of incidence,

From

From a great number of Experiments made by *Mons. l'Abbé Bossut*, à l'Ecole Militaire, the following important conclusions were however drawn :

I. That the resistance which a body (no matter what its figure be) meets with, when moved with different velocities through a fluid, is nearly as the square of those velocities.

II. That the perpendicular and direct resistance of several plane surfaces, moving with the same velocity, will be nearly in proportion to the extent of those surfaces.

III. That the resistance of a fluid when acting obliquely on a body does not by any means decrease in the proportion of the square of the angle of incidence ; consequently the common theory, as leading to conclusions exceedingly erroneous, and of which the error increases in proportion as the angle of incidence becomes more acute, ought entirely to be laid aside.

IV. That no species of curve can be discovered from calculation that will, by revolving round its axis, generate a solid of the least resistance ; for the equation of this curve, as appears from the foregoing observation, is impossible to be found.

V. That the resistance which a plane surface experiences, when opposed directly to a fluid, is equal to a column of the same fluid whose base is of similar dimensions with the surface struck, and whose altitude is the same as that from which a body must fall to acquire an equal degree of velocity with the fluid.

VI. That the tenacity and friction of water along a smooth surface is insensible.

Mons. de ROMME, from a number of Experiments made at the port of Rochefort with bodies measuring 13 or 14 feet in length, and 5 feet in breadth, has established the following facts:—

I. That prisms of different dimensions, if they present to the shock of a fluid surfaces of an equal extent, are equally resisted.

II. That the arc of a curve experiences the same degree of resistance as the chord.

III. That having made two vessels, the one an exact model (in the proportion of *one to twelve*) of a 74 gun Ship, and the other with the same midship-bend, stem, and stern-post as a 74 gun Ship, but with water-lines straight instead of curved, he found that these two bodies, notwithstanding the enormous difference of their capacities, experienced precisely the same degree of resistance. *M. de ROMME* likewise discovered, that the body advanced with the same celerity when drawn by the head as when drawn by the stern ; of course, that it was indifferent which end moved foremost. But what seems to prove, beyond all doubt, that the particular form of the bow facilitates little, if at all, the dividing of the fluid, is, that having cut the two models in half, and joined the head of the one to the after-part of the other, and *vice versa*, these two irregular bodies experienced the same degree of resistance when drawn by the head as when drawn by the stern.

Many other extracts, equally curious, might be given ; but as the person who made these has no other view than to recommend the principal

principal facts to the attention of those who may be engaged in repeating similar experiments, he is unwilling to intrude longer on the patience of the reader. He hopes, however, to be excused in making a remark on one of the above observations.

Monf. l'Abbé BOSSUT remarks, that friction has not any sensible effect in retarding the velocity of a body moving in a fluid: but the contrary is easily proved; for by rubbing a vessel's bottom with tallow, its passage through the water is found to be greatly facilitated.

The seemingly unaccountable circumstance mentioned by Monf. de ROMME, that when he united the head of one vessel to the stern of the other, he could not discover any alteration in the degree of resistance, appears to me to have arisen from his not causing the bodies to pass through the water with sufficient velocity. Had the rapidity of their motion been greater, I apprehend that the difference of resistance would have been perfectly obvious. The manner in which Monf. de ROMME and Monf. l'Abbé BOSSUT made their experiments is far from unexceptionable: the heaping up of the water at the bow of the solid, the depression of the water at the stern, and perhaps the action of the water on the head and on the stern, might prevent the solid from being parallel to the horizon. These circumstances, which unavoidably attend this method of making experiments, probably produced considerable errors.

The plan I should propose for conducting experiments of this kind would be to float the different solids in a regular stream of water, running at the rate of six or seven knots an hour, the cord by which they are held to pass over two pulleys, and have made fast to the end of it a scale containing a weight sufficient to counterbalance the effect of the water on the solid.

From some experiments lately made on the resistances of bodies moving in water, by means of a pendulum (a method far from the most eligible), there is reason to believe, that of all solids constructed on the same breadth, a cube moving anglewise is the most retarded; and that of all solids constructed on the same breadth, length and depth, a double circular spindle, whose greatest breadth is at the distance of 2-5ths from that end which moves foremost, and which being supposed to be intersected by two planes (in the direction of its longest axis) at right angles to each other, and having the four circular parts contained between these planes cut away till they become rectilinear, will divide a fluid with the most facility.

In the *Discours Preliminaire* of *L'Examen Maritime*, par Don GEORGES JUAN, are the following words, which militate strongly against many of the above-mentioned facts. "Our experiments (says the author) most satisfactorily prove, that the resistance which a body meets with, when moving in a fluid, is not in proportion to the square of the velocity and the square of the angle of incidence, but it is as the simple velocity and as the simple angle of incidence.— Again: "According to this new theory, the resistance will be in proportion to the density of the fluid; to the surface exposed to the shock; to the square root of the depth at which it is immersed; to the simple velocity, and to the simple angle of incidence."

On

On casting the eye over the foregoing extracts, taken from different authors, and of which, though all are given as facts, some are certainly doubtful, others perhaps false, and a few evidently contradictory, we may safely draw this conclusion—That it is in vain to expect that the Science of Naval Architecture can receive any considerable improvement till the Public are in possession of an accurate set of Experiments made on a large scale, with bodies of different forms moving in a fluid, with different degrees of velocity, and immersed to different depths.

It is therefore most earnestly requested, that those who are desirous of promoting the Science on which, as a nation, our consequence in the political scale of Europe depends, will bestow some part of their time in making, in the most unexceptionable manner, such Experiments as may serve as so many data for drawing practical conclusions.

To Mr. SEWELL.

S I R,

THE utility of your design, in publishing the Papers on the Improvement of Naval Architecture, is too manifest to be insisted on: it is an Art which, of all others, we might reasonably suppose the English would excel in; but from the few writers we have on the subject, it seems that the Ship-builders have derived little advantage from their scientific countrymen; what improvements they make in constructing Vessels seem to be entirely owing to *chance experiment*, if the expression may be allowed.

Your Catalogue of Authors, though not complete, will prove of essential service; as by this means several publications, hitherto in a manner unnoticed in England, are likely to be brought forward, and probably may meet with the attention they deserve; particularly EULER's Treatise, translated by the late Colonel HENRY WATSON. The well known abilities of the author and translator is the best panegyric on this publication.

Col. WATSON, to an extensive knowledge of the theory, joined experiment and practice: he had made the subject his particular study for many years, and two Ships (the *Nonfuch* and *Surprize*), which he built in the East Indies, shewed his superior skill, as they proved the swiftest sailers of any vessels ever constructed. He intended to have built two Indiamen on a plan entirely his own, but did not live to execute his design. Most of his papers and drawings on this subject be, I believe, in the hands of his executors; but the superintendant of his works is at this time in possession of the several dimensions of those vessels, if I am rightly informed.

As you intimate that a PUBLIC LECTURE is in contemplation, no doubt but Theory and Experiment will form the principal part: on the latter head, the following quotation, from page 256 of the above-mentioned work, will speak for itself.

“ From good models in miniature, which represent vessels exactly as they are, very important experiments upon the resistance of vessels may be very usefully made; and which is so much the more necessary, as the theory upon this subject is still very defective, as we have already
ready

eady remarked. But for this purpose it is not necessary that the model should represent the whole vessel entirely; it will be sufficient to express exactly the figure of the body, and in particular its surface, even to a degree of polishing; since we have observed that a greater or less smoothness is capable of producing a sensible change in the resistance of vessels. It would therefore be superfluous to represent in such a model all the interior parts of the vessel, and still less all which is above the water line; but it is necessary to load the model in such a manner, that when put into the water its immersed part may correspond exactly to that of the vessel itself. We readily conceive that, by making several such small bodies of different figures, we might obtain very important conclusions for perfecting the construction of vessels; since the experiments, which we might easily make, would lead us without any difficulty to a discovery of the good or bad properties which great vessels, executed according to such models, ought to have with respect to the resistance."—A method of making the experiments is given immediately after.

Experiments of this kind are the more necessary, as the laws of the resistance of fluids, and of the force of bodies in motion, do not seem to be well established. Some mechanical writers have recommended the figure of a segment, or segments, of the *solid of least resistance*, as the most proper for the immersed part of a ship; but though this might pass through the water with the greatest velocity, yet it would be too liable to pitch and roll, and therefore improper to be totally adhered to in practice.

Some experiments on the resistance of fluids have been made by the Abbé BOSSUT, Professor of Hydrostatics, and others lately by a Gentleman in London; but the result of these last I believe has not been made public.

But Experiments will be attended with expence; and therefore, is it not highly probable that a SUBSCRIPTION would be a very likely means of forwarding your researches? For it is too true, that men of science, and such as are the most anxious for carrying any laudable or useful designs into execution, are generally, in point of fortune, the least qualified: And it is from voluntary contributions the SOCIETY OF ARTS and MANUFACTURES are enabled to encourage useful invention.

Since your ultimate view must be to assist the Master Ship-builder, would it not be advisable to procure, if possible, the Papers and Drawings of Col. WATSON on the subject, in order to build a vessel (should a subscription furnish the means) according to his plan (or an improvement of it, if found practicable), and send her on a trading voyage by way of experiment?—If an undertaking of this kind, after consideration, should be thought consistent with your plan, or likely, in any respect, to answer the end proposed, perhaps you may hear again from,

S I R,

Your most obedient servant,

August 9, 1790.

D.
QUESTIONS

QUESTIONS IN NAVAL ARCHITECTURE.

IS not the present breadth of the keel too little?—Ought not the keel to be at least square, and that square in some degree proportioned to the length?—*i. e.* I mean, should not the keel of a ship be as broad as it is deep? My reason for thinking it should be so, is this:—The keel is the foundation on which the ship is built, therefore it should have as much solidity as possible in the nature of things. The floor timbers are the ground-work (it is true) of the frame, but the keel is the foundation on which the floor timbers are laid; and I think may not inaptly be stiled the *back-bone*, as the timbers are sometimes called by nautical people the *ribs*. Giving the keel its full or proper proportionate breadth, would give strength to the floors, and of course to the whole ship. I also think it would make a ship more buoyant, as it would give more breadth to her tread.

NUMBER VI.

To Mr. SEWELL.

SIR,

I THINK it might further your laudable design of introducing improvements in building the Royal Navy, if you were to reprint the great Sir WILLIAM PETTY's outline of *Naval Philosophy*, a piece omitted in the collection of his works, though highly deserving (like every other of his performances) of particular attention. It was printed in an obscure publication which appeared in 1691, the Editor of which gives the following account of it, in his Dedication to the Earl, afterwards Duke of MARLBOROUGH:

“ My Lord, I have herewith, for your Lordship's farther entertainment, thought fit to publish Sir WILLIAM PETTY's rough draught of *Naval Philosophy*. The filings of gold are precious, and a schylz or hasty piece of painting, done by a great hand, is of great value. To have drawn so great an historical picture of that philosophy as he had the idea of in his mind, would have took up his whole life: and he therefore, considering the little value the age hath for such curiosities, thought it only worth his while to finish this piece up at one sitting, and to shew posterity what he could have done. But in this, as it is, the judicious few will find many a *coup de maitre*, and may instruct themselves thereby in some very considerable principles relating to Naval and Maritime knowledge.”

I need add nothing in praise of Sir WILLIAM PETTY's works; but think it would be very praise-worthy in his descendant, and the inheritor of his property, the Marquis of LANDSDOWNE, to give the Public a complete edition of them worthy of his great ancestor.

I am, &c.

A TREATISE

A
T R E A T I S E
OF
N A V A L P H I L O S O P H Y :

IN THREE PARTS.

- I. A PHYSICO-MATHEMATICAL DISCOURSE OF SHIPS AND SAILING.
- II. OF NAVAL POLICY.
- III. OF NAVAL OECONOMY OR HUSBANDRY.

THE FIRST PART

Contains the several Sorts and Clases of EXPERIMENTS under-mentioned,
viz.

1. **T**HE specific weight of *water*, and *timber*, and *irons*, as also the several materials whereof *shipping* is composed.
2. The absolute and comparative strength of *wood*, *metals*, and *ropes*, in their several dimensions, figures, and quantities, and how much the strength of the same is *diminished* by notches, holes, and other excavations, or *increased* by the texture and grain of the said materials.
3. The *motion*, *strength*, and *matter* of the wind.
4. The *motion*, *strength*, *course*, and *figure* of waters, upon the surface thereof in *rivers*, *tide-ways*, *currents*, and *eddies*; as also in the *ocean*, whether the same be spontaneous, or by agitation of the wind.
5. Of the *tractive* and *pulsive* forces upon *swimming bodies*, in respect of *strength*, *time*, proportional increase of *swiftness*, *lines of direction*, *superficies of resistance*, *magnitude of the movent bodies*, and *impression of force* in various angles of incidence and reflexion.
6. Several *hydrostatical experiments* relating to *pumps* and *leakage*, according to several parts of the ship, and depth under water, wherein the same may happen.
7. Experiment of *spinning*, *twisting*, and *wearing*, with reference to *sail-cloth*, *cables*, and all other sorts of cordage.
8. Experiments upon *pitch*, *tar*, *rosin*, *oil*, *brimstone*, *tallow*, *okum-leather*, &c. relating to the *sheathing*, *caulking*, and preserving of vessels, and their appurtenances, from the injuries of *water*, *weather*, *worms*, and *weeds*, and of their *weight*, *extension*, *duration*, &c.
9. Of the choice, *seasoning*, and preparing of *timber* and *plank*, *knees*, and *trenails*, as also of *iron*, *hemp*, and other materials used in *shipping*.

10. Of the particular power of *oars, wheels, poles, draught of men and horses*, with reference to their actions upon vessels, and of reducing them all to one and the same calculation and principle.

11. Of *sounding* and measuring the *depth* of water, and of discovering the nature of *ground* as to the *hold-fast of anchors*, wear and tear of *ground-tackle*, with what else belongs to the artificial moving and riding of Ships upon all occasions.

12. *Magnetical, barometrical, and optical instruments* and experiments.

13. *Nautical geography and astronomy*.

14. *Nautical statics and mechanics*, relating to *pullies and crows, hand-spikes, screws, hances, kildwedges, nippets, capsterns, windlasses, slings, &c.* in order to the landing, masting, leading, careening, and weighing up of a Ship.

15. Of *gun-powder*, the several sorts of *metals* for *guns and shot*; their several figures and proportions, in order to the several effects of *penetration, battering, and direct shooting*.

16. Of several observations upon *loading* of a Ship with *lead, wood, cotton, liquor in cask, corn, salt, frail and timber*: and the accidents which usually fall out in each of the said sorts of loading, with reference to the safety and well sailing of a vessel.

The said *first part* containing also the *definition and division* of a Ship in its several parts, together with a selection and description of the principal things and notions which are to be considered in *framing and fitting* of a Ship for the several uses unto which the same is designed, in manner following:

1. A Ship is understood to be all from the *keel* to the *vane*, and from the extremity of the *bowsprit* to the *lanthorn*.

2. The said Ship is divided into *hull, sails, and her burthen*.

3. The *hull* is considered but as one piece of timber, and carved out of one log, and is divided into what is under the *upper-deck*, out of which all waters is to be excluded. And what is above the same, as *cabins, round-house, cuddie, fore-castle, coaches, &c.* which may be rather esteemed as part of the burthen of a Ship, than *essential part* of the same.

4. The *hull* under the said *upper-deck* is divided into the *cavity or hold*, whether the same shall be subdivided by other *decks and bulk-heads* or not, as also into the *shell* of the said *cavity*: and thereby into the *additaments* affixed to the outside of the said *shell*. Such are the *false stem, gripe, keel, stern-post, and dead-rising* up the *tuck*, excluding the *rudder*.

5. Upon the *shell* of the Ship, or rather of the said *cavity*, there are to be considered the several *lines* undermentioned, to be drawn *parallel* to the *keel*, viz.

1. The *line* unto which the *hull* of the Ship sinks upon her *launching*.

2. The *line* unto which the whole Ship *sinks* when she is *rigged, ballasted, and fitted* for the best advantage of sailing, and manned with a sufficient

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15. Of *gun-powder*, the several sorts of *metals* for guns and shot; their several figures and proportions, in order to the several effects of *penetration, battering, and direct shooting.*

16. Of several observations upon *loading* of a Ship with *lead, wood, cotton, liquor in cask, corn, salt, frail and timber*: and the accidents which usually fall out in each of the said sorts of loading, with reference to the safety and well sailing of a vessel.

The said *first part* containing also the *definition and division* of a Ship in its several parts, together with a selection and description of the principal things and notions which are to be considered in *framing and fitting* of a Ship for the several uses unto which the same is designed, in manner following:

1. A Ship is understood to be all from the *keel* to the *vane*, and from the extremity of the *bowsprit* to the *lanthorn*.

2. The said Ship is divided into *hull, sails, and her burthen*.

3. The *hull* is considered but as one piece of timber, and carved out of one log, and is divided into what is under the *upper-deck*, out of which all waters is to be excluded. And what is above the same, as *cabins, round-house, cuddie, fore-castle, coaches, &c.* which may be rather esteemed as part of the burthen of a Ship, than *essential part* of the same.

4. The *hull* under the said *upper-deck* is divided into the *cavity* or *hold*, whether the same shall be subdivided by other *decks* and *bulk-heads* or not, as also into the *shell* of the said *cavity*: and thereby into the *additaments* affixed to the outside of the said *shell*. Such are the *false stem, gripe, keel, stern-post, and dead-rising* up the *tuck*, excluding the *rudder*.

5. Upon the *shell* of the Ship, or rather of the said *cavity*, there are to be considered the several *lines* undermentioned, to be drawn *parallel* to the *keel*, viz.

1. The *line* unto which the *hull* of the Ship sinks upon her *launching*.

2. The *line* unto which the whole Ship *sinks* when she is *rigged, ballasted, and fitted* for the best advantage of sailing, and manned with a sufficient

a sufficient complement for that purpose, victualled with three months victuals, and furnished with defensive arms.

3. The *line* unto which she sinks loaden as a *merchant man*.

4. The *line* unto which she *sloops* upon a wind of either side.

5. The *line of horizontal-section*, where the *gun deck*, and all other decks and orlop ought to be plac'd, and the *lines* to which the *ports* between each *deck* ought to be made.

In the next place is to be considered the three *perpendicular length-way sections* following, viz.

1. The section of splitting the whole Ship, cabin, and all other superstructures included between the *plank-sheering*, and the *keels*, the upper line of which section is called the *sheer* of the Ship.

2. Upon the general and most comprehensive section I propound, that all the *horizontal lines* before-mentioned may be marked together with the *bottom line* of the interval cavity or hold before-mentioned.

Lastly, let there be a *transverse section* of the *hull* at the *main bend*, within which let two other *parallel sections* be described arising from each extremity of the *keel*.

Next to the several *lines* and *sections* before mentioned, it will be necessary to take notice of the *center of gravity* and *magnitude*, as well of the whole Ship comprehended between the *keel* and the *vane*, as of the several parts thereof, viz. The *centers of gravity* and *magnitude* of that part which is under the water; as also of that which is above the water in the air and wind.

2. The same also to be observed when the Ship swims upon an *uneven* and *unevel keel* drooping forwards, or sending aft.

3. Consideration is to be had of that *line* which by a *spindle* passing and fixed into the ground, the Ship lying cross a current when no wind at all is stirring, would be *in equilibrio*; also the like *line* passing through the supernatant part of the Ship would also be *in equilibrio*, its broad side lying to the wind in dead water.

In the next place there ought to be considered the proportion between *the way of the Ship* cut off at its greatest *transverse section*, and *the way of the same* shaped from the same section forward in the usual manner, or to his best advantage.

2. The proportion between the *resistance*, between the perpendicular *length-way section*, and outside of the hull shaped as is usual.

3. Between the *horizontal section* at the *water line*, and the *bottom* of a Ship in its usual shape.

C H A P. II.

BEING thus furnished with the sixteen sorts of *experiments* above-mentioned, and with the clear and definite understanding of the *several parts* of the Ship, and of all the *several sections, lines, centers, and proportions of resistance* above-mentioned; we then proceed upon the third branch of the first *general part* as followeth, viz. Suppose we have before us a piece of *timber* of equal substance, of an indefinite length, and square at both ends, we are now to consider by what process

process to carve out of the same the *hull* of a Ship, which work will contain the several considerations following:—

(1.) Of what *length* to cut the said *timber*, which at first we will suppose to be the *length* of *four sides* of the square, intending hereafter to debate whether the same ought at all to be *longer* or *shorter*, and in what cases.

(2.) Suppose the said *square* be divided into *twelve parts*, and that seven of them shall be under water when the Ship is loaden.

(3.) Dividing the *length line* into *twelve parts*, and at three of them let the two *sides* converge into an *angle*, whose sides let be *portions of circles* unto which the remaining strait part may be a *contingent line*, which angle is the first means of facilitating the Ship's way through the water.

(4.) At four parts let the *bottom superficies* converge into an angle, with the *horizontal section* above-mentioned, viz. at the Ship's greatest draught of water.

(5.) At the said section let the sides *downwards* converge into an angle, consisting also of *circular lines*. This last angle is made for the Ship's *ease of falling* into the sea, as the two first were for its *easy* passing through it.

In the next place we must provide for the coming of water to the rudder, which is to be performed by two other angulations, viz. From *fifteen parts aft*, let the sides of the Ship converge into an angle from the *horizontal section downwards*; where the Ship draweth least water at her launching, which will be the *height of the tuck*, let the *bottom superficies* be bent in a *circular line*. And thus we have in gross set down the *five incurvations* of the bottom and sides of our log, and how the *but-ends* thereof have been as it were abolished *forward on* for the *easy passage* of the vessel through the water, and *ast* for the quick and effectual pulse of the water upon the rudder.

In the next place we come to the like shaping of the remaining part of the *log*, which we intend shall swim above the water, which is performed as followeth:

Let it be supposed that the Ship upon a wind is to stoop upon a certain angle, let the supernatant sides of a Ship so much *tumble* (as they call it) as that the said *sides* may remain *perpendicular* when the Ship *stoops*, which being done quite round the upper surface, the remainder will be the *shape and section* of the upper deck.

Memorandum, That all the forementioned incurvations are to be trimmed and repaired by reconciled lines.

In the next place we come to *hollowing* or *excavating* of our *log*, which suppose (beginning at the *middle*) we do (leaving equal thickness) every where until the *log* become so light that it swims at the line representing the *launching line*, and consequently we have now acquired the *model of a Ship* as it appeareth in her launching, except the cabins and what is usually superstructed upon the upper-deck.

In the next place we are to consider how far *ballast* and *weight of rigging*, &c. will sink the said Ship; and secondly, how much *deep* the weight that must be added to fit out a *man of war* will depress her, for till then we cannot rationally determine the place of the *gun-deck*:

deck: wherefore the next enquiry must be, what *extent of sail* our vessel must carry, and consequently the *length of the masts and yards*, and then of their *thickness and weight*; and from thence the *size of the rigging*, and from thence the *wind-loft*, and from thence the *cables and anchors*, and from thence all the *capsterns and windlass boats, bits, catheads and davits*.

In the next place we are to consider the *quality, quantity, and weight* of our *ballast*, so as the Ship may stoop but according to our intention, and according to the *strength of our masts and sbrouds*.

Having thus found out our second water-line, which I call the *sailing-line*, as the first was called the *launching-line*; now we come to the *third*, which is the *line of war*. And this is to be discovered by computing the *weight*, first, of the *ordnance*, which suppose to be in a man of war one 6th part of what is between the *sailing-line*, and the *line of burthen*, or *fourth line*; secondly, the *weight of men with three months victuals*: in order thereunto we must determine the number of men for *sailing* from the *spread of canvas*, and the number of men for *fighting* from the *amplitude of the deck*, and *weight of the ordnance*.

Having found out the said line, and considered the *distance of trunnions of the guns* from the *gun-deck*, and the *distance of the muzzles of the guns* levelled from the surface of the water, we come at length to determine the place of the *gun-deck*, and consequently of the other *deck*.

Memorandum, That the *superstructions* upon the upper-deck are not only for the *accommodation of men*, but also *fortifications of the Ship*; forasmuch as the guns in the *forecastle and steerage* clear the *deck*, as those of the *round-house* do the *quarter-deck*.

Having found the *dimensions of the masts*, we next come to the *place of them*, viz. by what points of the *gun-deck* they must pass. And here we must consider the reasons of their *raking ast*, as also of the *steering of the bowsprit*, and withal the reasons of placing the *top-mast* before or behind the *main-mast*, and of dividing each mast into three parts, and the *proportion of the round-tops, main-stays*, the *place and fitting of the shroud* so as to make way for the *gibbing of the yards*, and *setting of the shrouds loose or taught* as the condition of sailing of the vessel requires.

N U M B E R VII.

C H A P. III.

1. THE reason of a Ship's going against the *wind*, and in what proportion she maketh way between her being *right afore the wind*, and lying within five *points of the wind*.
2. The whole doctrine of *steering and rudders*.
3. The whole doctrine of *mooring and anchors*.
4. Of the *lee-boards*, their use, dimension, and place.
5. What sails, masts, yards, and rigging is fittest for every size and sorts of vessels, according to the *seas and service* whereunto it is to be applied.

6. Of

Of the *shape, cutting, sewing, and setting in of sails* into the *head- and bolt-ropes*; of the *several substance and thickness of sails*, and the effect of *welling them, easing of throwds, looseness of masts, upper masts.*

Of the effects of *true trim, shutting up the ports, general quiet-firing of stern-pieces, and the best course upon a chase.*

How *top-sails, flooping, weather, or leeward helm*; as also how *heel, gripe, and mizen-sail*, may be fitted to *promote or hinder the* upon occasion.

What makes a Ship *roll and labour-some* in the sea; what makes her *wear and stay well*; and what makes her *ride hard or easy* at an anchor; what makes her *pitch and scend* too much; what makes her *easy or hard* into the sea; what makes her *leeward or keep a good*

6. Of the just proportion of sails with *more or less* that which will make the Ship go *worse*; of *equations* between the *spread of sails*, and the *velocity of the wind*: Of the utmost *velocity* of a Ship with *wind and*

7. Of the proportion of the *counter-resistance* of winds or tides; why some Ships sail better with *much*, and some with *less* proportionably.

8. How to compute the *impediment* which *foulness* and *weeds* do in a Ship's way, and in what proportion *smoothness, soap, and* doth quicken it.

9. How a Ship is to be fitted with *decks*, to beat it up to windward foul weather, why the *fore-sail* must be *less* than the *main-sail*.

C H A P. IV.

WE have hitherto supposed the Ship to be exactly shaped inside and outside out of one simple *log* of wood, which being impossible to do otherwise in speculation, it is necessary to come at length to the practical part of *Ship-carpentry*, which is the art of imitating the model aforementioned, and of composing a Ship, not out of one but several thousand pieces of wood and iron: Wherefore this Chapter shall commend as followeth:

1. The history of the *practice* of the best *Shipwrights* in *England, France, and Portugal*, in their *building Ships* as aforesaid.

2. Supposing that a Ship commonly reckoned 150 ton, be a *fit size* to sail in round the world, and that the just strength of every part of the same were certainly known and determined, it is desired to know what *size and scantling* each *correspondent* timber must be of, to make a *greater or lesser* vessel of equal strength, and to compute the *difference* of strength between *greater and smaller* vessels of the common

3. How to make practical *equations* between the strength of *timber, iron, and between trenails and bolts, &c.*

4. Out of what *data* arises the knowledge of the strength of *knees, and nails.*

5. That vast Ships of 1500 tons do require a *different way* of carrying of *masts and yards* than what is used, and particularly in no mast above 30 inches *through*, and above 3-4ths the present *thickness* is requisite.

C H A P. V.

1. WHAT alterations in Shipping the use of the *compass* and *guns* have produced, and consequently how to conjecture what was the Shipping of the *Ancients* in these countries.

2. How the *difference of the materials* for building; the difference of trades and commodities, and the differences of *defensive* and *offensive* warfare, doth occasion differences of Shipping in the several parts of the present world.

3. The history of the *improvement* of Shipping, sailing upon a wind, and *advance* of the Shipping trade for the last twenty years, by the *Portugals, Gen vese, English, Netherlands*, and the inhabitants of the *Baltic*.

4. A description of several attempts which have been made these last twenty years for the improvement of Shipping, with the respective *successes* and *failures* of each.

THE SECOND PART,

BEING OF

N A V A L P O L I C Y.

C H A P. I.

THAT the *King of England*, being not only by right and custom *Sovereign* of the *Narrow Seas*, but having also the best means and most concernment to be more considerable at sea than any other *Prince* or *State*, it is therefore his *interest* to know and discover as followeth:

1. How many *ton* of Shipping there be in the whole *commercial* world, from 15 to 1500 *tons*, as are able to cross the seas, and how many Ships there be of each century of times with the said 15 centuries.

2. How many *ordnance* belong to them, and of what *weight*.

3. How many *seamen* there are in all, and particularly of such as have served three years at sea.

4. To have *lists* of all the Ships and *seamen* belonging to any *ports* or places within his own dominions; and a ready method to know *where* they are at all times, at *home* or at *sea*.

5. What *harbours* and *ports* there are in the whole *commercial* world, unto which Shipping does belong, and what Ships they are able to receive, what are the special *advantages* and *inconveniences* of each.

6. What is the *wages* and *rate* of *viſuals* for *seamen* in each *State*.

7. To have intelligence of all *privateers*, *pickeroons*, and *pirates* which are *abroad* at all times, and in a forwardness to go forth.

From

From hence only his *Majesty* can know how to proportion his *Navy*; that is to say, his *Navy* cannot or need not consist of *more tons* of Shipping than are *seamen* of his subjects, and *one quarter* more: I say, *greater* it cannot well be, and it need not be much *bigger* than of *so many* tons of Shipping than any two of his *neighbour States* have man to man with preservation of their trade: And the intelligence last-mentioned determines the *number* and *sorts* of Ships which are to be always in readiness. Moreover, the *King's Navy* must be of Ships above 600 tons, but need not have *half* so many lesser as will suffice in time of exigence, for such may be hired from merchants.

C H A P. II.

1. OF the *advantages* situate upon the *sea* and *navigable water*.
2. Of the *benefit* of a Shipping trade in general.
3. Of the *fishing trade*, and how far the subjects of the *King of England* are able to manage it, and what have hitherto been the *impediments* thereof.
4. Whether it were for the *benefit* of the Commonwealth that *coals* were found near *London*, and that good *tobacco* and *sugars* would grow in *England*, forasmuch as a parcel of proper fitting ground of twelve mile square, would bear as much of these commodities as do now come from *America*.
5. Of what benefit to the world is the discovery of new *countries*, new *passages*, new *mines* of gold, of *silver*, and of the *longitude* itself.
6. What *increase* of trade doth really signify and import.
7. The effect of depending upon *foreign countries* for *hemp*, *tar*, *masts*, *rozin*, and *sail-cloth*.
8. Of the whole *expence* of a *fleet*, how much of that from *foreign countries*, and how much is the *domesticks* in value.
9. The same *Englishmen* who now work upon *exported commodities*, as *woollen manufactures*, *lead*, *tin*, &c. did go to sea in men of war. Query, Whether they would not take as much *commodities* by way of *prize*, as they now receive in *exchange* for their said *exportations*.
10. Of the *decay* of *timber* in *England*, *Scotland*, and *Ireland*, with the causes and consequences, and remedies thereof.

C H A P. III.

1. WHETHER *landmen* and not *seamen* bred, be fitter to command at sea.
2. Of all the men in a *fleet* of war, how many ought to be *perfect seamen*, how many of five lower degrees, and how many may be *landmen*.
3. How, in what time *land soldiers*, and other tradesmen of labour may be made auxiliary *seamen*, and how many such may be requisite in cases *ordinary* and *extraordinary*, and how the said men may be encouraged and employed at land to the public benefit.
4. Of allowing encouragement to *impotent seamen*, with the number of them, and how to *assist* such *seamen* as are low of employment.

OF
NAVAL ECONOMY OR HUSBANDRY.
THE THIRD PART.

HAVING determined the *number* of the tons of Shipping of which the *whole Navy* is to consist, and *how many* Ships in number they ought to be; as also *how many* of each *size* and *rate*, and in what and *how many* harbours they are to be kept, so as to be ready to put to sea upon any occasion; it remains to set forth *how* the same may be done with the *least charge*, and with the *least expence* of *foreign commodities*, to which purpose the following particulars are to be considered:—

1. Forasmuch as a *Ship* doth commonly reign about thirty years, it follows, that the 30th part of tons of Shipping, of which the *whole Navy* consists, must be new built every year, the which may probably cost 15*l.* per ann. with gunners, boatswains, and carpenters stores.
2. The charge of the *English Navy* in *ordinary* has by experience amounted to 20*s.* per ton per annum.
3. For charge of maintaining a man of war at sea, completely fitted, victualled, and manned, with the *expence*, wear, and tear of all manner of stores, doth amount to 24*l.* per annum.
4. There are *estimates* by which money must be provided for the use of the *Navy*, but by good husbandry the charge may be defrayed at a more easy rate; wherefore we shall in the next place describe historically the present way of managing his Majesty's *Navy* in *England*, and afterwards make some animadversions upon each of the *three* great branches of that *expence*, which is *wages*, *victuals*, and *stores*, subdividing each of them again into several other branches, as the nature of the thing and custom requires.

NUMBER VIII.

Extracted from the PENNSYLVANIAN PACKET, *May 7, 1790.*

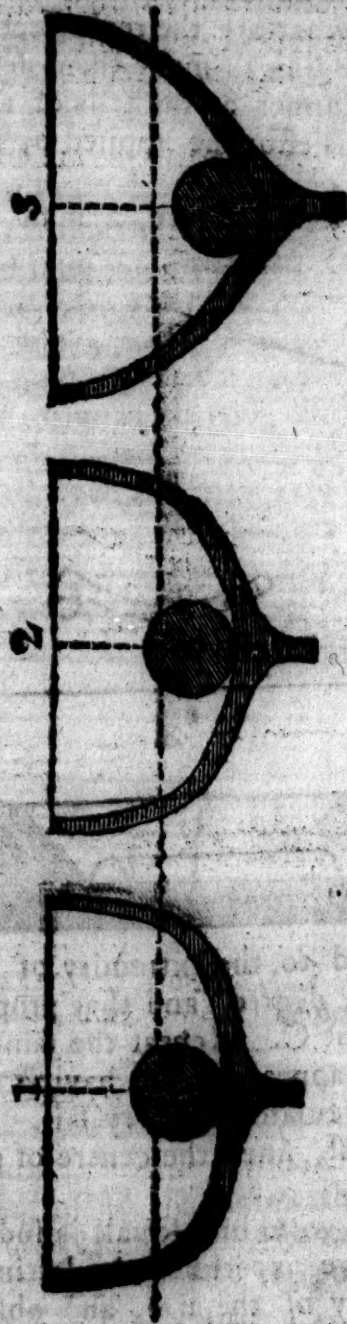
An ESSAY on the PRESENT STATE of the UNITED STATES of AMERICA, By FINCH COXE.

SHIP-BUILDING is an Art for which the United States are peculiarly qualified, by their skill in the construction, and by the materials with which their country abounds; and they are strongly tempted to pursue it by their commercial spirit, by the capital fisheries in their bays and on their coasts, and by the productions of a great and rapidly-increasing agriculture. They build their Oak vessels on lower terms than the cheapest European vessels of Fir, Pine, and Larch. The cost of an Oak Ship in New England is about 24 Mexican dollars per Ton fitted

fitted for sea; a Fir vessel costs in the ports of the Baltic 35 Mexican dollars, and the American Ship will be much the most durable. The cost of a vessel of American live Oak and Cedar, which will last, if salted in her timbers, 30 years, is only 36 to 38 dollars in our different ports; and an Oak Ship in the cheapest part of England, Holland, or France, fitted in the same manner, will cost 55 to 60 dollars. In such a country the fisheries and commerce, with due care and attention on the part of Government, must be profitable.

EXPERIMENT UPON MIDSHIP FRAMES.

BY ANOTHER CORRESPONDENT.

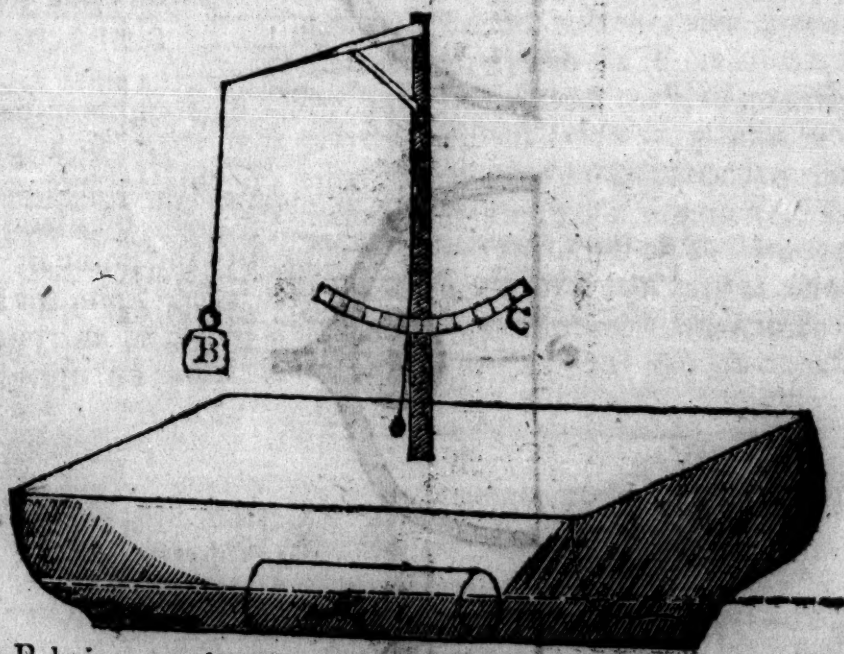


HAVING constructed three Midship Bodies, viz. No. 1, 2, 3, being each eight inches wide at the water-line, and a foot and a half long,

long, the cylinder A is of lead of equal size and weight; of course, being placed in the bottom of the Bodies 1, 2, and 3, those Bodies (being exactly of equal weight) will be immersed equally in the water, though the cylinder of lead lying in the bottom will be more or less under the surface of the water; of course, the centre of gravity will be more or less elevated or lowered. No. 1, having a flat and shallow body, the cylinder and center of gravity will be placed higher than in No. 2, and still more than No. 3; and therefore, if it should be found that No. 1 is higher, and makes more resistance to the force applied to make it heel than the others, it must be owing to the form of that Midship Body, as well as to the weight of the leaden cylinder. In No. 2 the centre of gravity lays something lower than in No. 1, consequently ought to resist the efforts to make it heel more than in No. 1 and 3, for the same reason, still more.

Let us now examine what are the real effects of a power applied to each of these Bodies, tending to make them deviate from a horizontal position, in the same manner as the sails of a real vessel acted upon by the wind; and let this effort be applied by a sudden as well as by a gradual impulse.

Place, as in the following figure, a mast with an arm extended from its extremity, viz.



a weight B being applied to the extremity of the arm will cause the body to incline a certain degree, and that proportion will be exactly indicated by the quadrant C. Repeat the same experiment upon the other Bodies, and it will appear which, having the same immersion, is from its form the best calculated to carry sail. If No. 1 resists equally, it is evidently the best, since the centre of gravity does not lay so low as in No. 2 and 3.

As the impulse of the wind in a squall is sudden, it will not be improper to repeat the above experiment by letting go the weight suddenly from the extremity of the arm, and observing with great accuracy by the quadrant, which may be constructed with teeth, so as to stop the line at the greatest degree of inclination which the body may receive.

THEORY

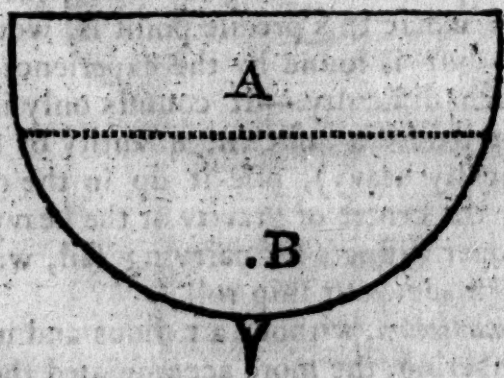
THEORY OF STOWAGE, AND EQUIPPING SHIPS,

So far as relates to the Disposal of the BALLAST, LOADING, and WEIGHTS of all Kinds.

BY THE SAME.

WHATEVER may be the form of the Ship's body (good or bad), her sailing in respect to her velocity and good qualities will depend greatly on the disposition of the weights she carries, in which is to be included her masts, rigging, guns, &c. If they are placed too high, she will not carry sail; if too low, she will acquire too sudden motions, which will occasion her rolling, and other qualities which impede her smooth and quiet passage through this fluid; if stowed fore and aft, these weights will occasion this action of pitching, by giving *momentum* to the extremities, of all others the greatest enemy to velocity.

In order to explain more clearly the effect of weights disposed on board any ship, it is necessary to observe, that there is a point A which the mathematicians who have wrote on this subject call the *metacentre**, which is the point upon which the vessel oscillates when put in motion. The distance from this point A to the point B, which is the centre of gravity, is to be considered as a lever, upon the length or shortness of which depends the more or less power of carrying sail, and resistance to the inclination of the vessel from an upright position.



If the centre of gravity B lays very low, the lever will be long and the vessel very stiff. If B lays high and at a small distance from the *metacentre* A, the lever will be short, and the power of carrying sail

* The mathematicians do not call the point about which the ship oscillates the *metacentre*—this point is the limit for the height of the centre of gravity.

less in proportion. The effects of the above will be as follows:—If the lever is short, that is, the ballast of a quantity specifically light in proportion to its volume, the power of carrying sail will be so reduced, that there will be no way of making up for that defect but by spreading that light ballast fore and aft, so that by its laying as low as possible, its centre of gravity may be placed at as great a distance as possible from that of the *metacentre*, so as to support the pressure of the sails.

But the consequence will be, that the ballast being disposed fore and aft, and the extremities being by that means loaded, the ship will be certainly subject to the action of pitching; a motion of all others the greatest enemy to velocity; since, beside many other objections, such as wear and tear, &c. &c. it destroys by its irregular motion all ideas of a fine and well-constructed water-line, &c.

On the other hand, it is as clear that ballast of a light quality in comparison to its volume, unless stowed fore and aft, and as low as possible, will not carry sail.

It then follows, that there are very great advantages to be procured by making use of the ballast the most specifically heavy.

But the advantages arising from the use of iron does not arise from its laying low and making the vessel stiff, but from its laying in a small space; so that it gives the necessary powers of carrying sail, without its being necessary to spread it fore and aft, so as to occasion the vessel to pitch; in which arrangement, it seems to me, consists one of the greatest secrets of fast and advantageous sailing.

It follows then, that the utmost application should be had to bring the centre of gravity of the ballast, and of all weights, as near the centre or midships as possible; and that the art consists in finding that exact distance between the *metacentre* and centre of gravity that each ship requires, according to her form; the *maximum* of which is, that the ship should not by the length of lever become too stiff and have sudden motion, which are a great enemy to velocity, by rolling, &c. &c. nor, on the other hand, from the lever being too short, the vessel should not be able to carry sail: where this precise point is, would be extremely difficult to calculate, but is found by the experienced and judicious seaman without much difficulty.—It consists only in this simple arrangement: Having provided a sufficient quantity of heavy ballast (it cannot be too specifically heavy), pile it up in the centre of the ship, raising or lowering the centre of gravity of the heavy ballast, till you have found the proper stiffness for carrying sail, without having, by stowing it too low, made your ship roll.

You are then arrived at the *maximum*, without a tedious and uncertain calculation; always remembering, the more accumulated the ballast is, the less your ship will pitch.

This system of ballast is equally applicable to every weight on board, masts and their position, yards, rigging, anchors, &c. &c. even the timber and upper-works of which this vessel is composed; in which you ought never to lose sight of this object. That all weights are to be collected to the centre, in order as much as possible to lighten and relieve the extremities; the effects of which seem to be neglected, or little understood.

NAVAL QUERY.

WHAT is the greatest ascertained Velocity with which the Waves of the Sea have been propelled by a Storm; and what Weight in Pounds Avoirdupois is their Impulse on a Vertical Plane of one superficial Foot equal to, such Plane being affixed to a Ship when going against the Sea at the rate of 5, 10, 15, or 20 Miles an Hour?

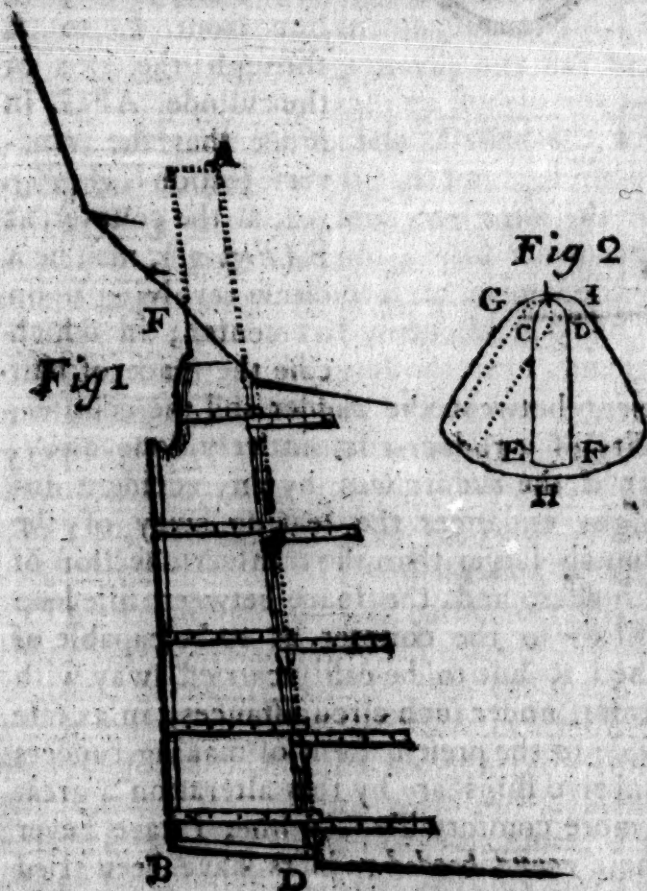
NOTE—A Ship cannot go against the Sea at any great rate, therefore 5 only is a sufficient Specification.

NUMBER IX.

To Mr. SEWELL.

SIR,

AN alteration, which I conceive to be a great improvement in the shape of the rudder, has been adopted for some years past, both in the East-India service, as well as in many other merchant-ships; and having never heard, although I have taken pains to enquire, any reasonable objection to its being likewise adopted in the Navy, I cannot help imagining that the plan would be at least tried in the King's ships were it more generally known; for which purpose I beg leave to send you a description of the alteration alluded to.

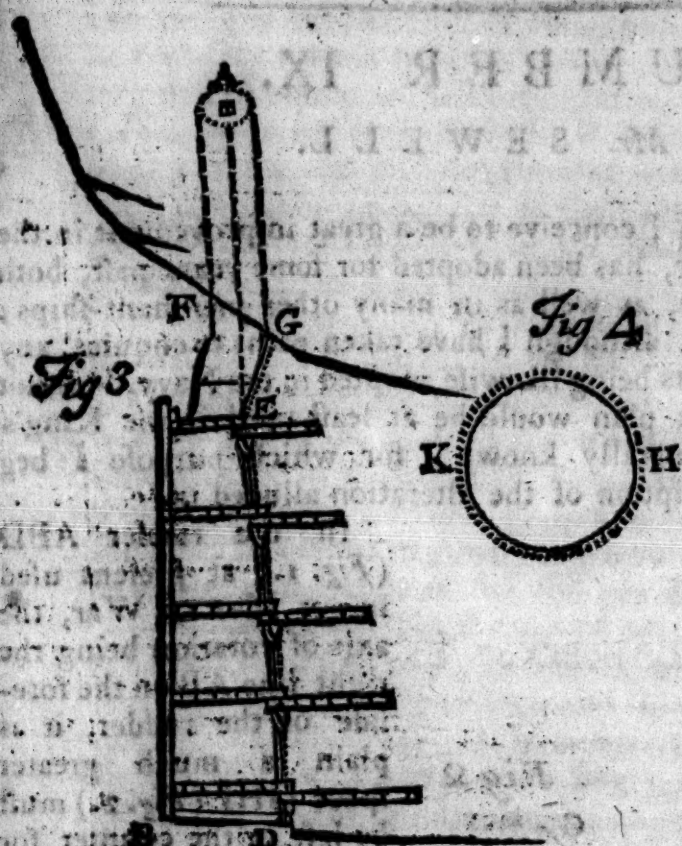


In the rudder ABD (Fig. 1.) at present used in our Men of War, the axis of rotation being the right line AB on the fore-side of the rudder, it is plain a much greater space GHI (Fig. 2.) must be left in the counter for the rudder to revolve in, than the area CDEF (Fig. 2.) of the transverse section of the rudder at F (Fig. 1.), at the counter; which space is never in a less proportion to CDEF than three to two, and therefore it is always necessary to have a rudder-coat, that is, a piece of tarred canvas, nailed in such a manner to the rudder and stern, as to cover the space between GHI and CDEF (Fig. 2.); but the canvas, being continually washed by the sea, soon becomes brittle, and unable to yield to the various turns of the rudder without

without breaking, in which case the ship is, of course, left pervious to waves, even of three or four feet high; in fact, there are few men bred up to the sea who have not been witnesses to the bad effects of such a space being left so ill-guarded against the stroke of the waves; and many ships have, with great probability, been supposed to founder at sea, from the quantity of water shipped between the rudder and the counter.

It was to remedy this defect that the alteration above alluded to

took place, which consists in making the upper part AFG (Fig. 3.) of the rudder ABD cylindrical, and giving that part at the same time a cast forward, so that the axis of rotation may, by that means, be the line AD (Fig. 3.), passing as usual from E to D, through the center of the braces which attach the rudder to the stern-post, but from E to A through the axis of the cylinder AFG, in order that the transverse section KH (Fig. 4.), at the counter, at F (Fig. 3.), may be a circle revolving upon its center; in which



case the space of half an inch is more than sufficient between the rudder and the counter, and consequently the necessity of a rudder-coat entirely done away. But as it was foreseen that if the rudder was by any accident unshipped, this alteration might endanger the tearing away of the counter, the hole is made much larger than the transverse section of the cylindric part of the rudder, and the space between filled up with pieces of wood, so fitted to the counter as to be capable of withstanding the shock of the sea, but to be easily carried away with the rudder, leaving the counter, under such circumstances, in as safe a state as it would be agreeable to the present form of making rudders in the Navy; so that I conceive ships are by this alteration a great deal safer, as well as much more comfortable. In fine, I have never heard a single instance where *round-headed* rudders have been tried (and I believe they are now general in the East-India Company's service), without being thoroughly approved.

I remain, Sir,

Your most obedient humble servant.

NUMBER X.

REPORT

OF THE

COMMISSIONERS

APPOINTED BY THE

ROYAL NAVAL ACADEMY

TO EXAMINE

M. V. DU CLAIRBOIS' TRANSLATION

OF
Mr. CHAPMAN's "TREATISE on SHIP-BUILDING."

MR. CHAPMAN's "Treatise on Ship-Building" is a work truly original, and the best which has been written on the subject by a Professional Man, and indeed appears to us to have thrown great light on this important branch of Maritime Science.

This celebrated Builder commences by shewing a new method of calculating (*déplacement*) the quantity of water displaced by the Ship's bottom, or measurement under the water-line, which, without being much longer, is infinitely more exact than that in common use. The curves of the water-line are generally considered as grounds or *data*: Mr. CHAPMAN, taking them for segments of a parabola, from the nature of a conic section or trapezium, draws a foundation for a most simple calculation. Some persons may consider this minuteness frivolous, but when we revert to the object, we must allow it demands the utmost degree of attention. It is but too true, that even in these days Ship-Building is in some degree defective; this perhaps arises from

from a multitude of little inattentions, each of trifling value when separately considered, but united in the same scale amount to a capital defect, and produce the most displeasing effects.

The Chapter on Stability (*Stiffness*) affords nothing new, as that subject has been treated by many authors. Mr. CHAPMAN follows their steps; at the same time Mr. CHAPMAN wishes to establish a proposition on the Mould of the Ship's Bottom (*la Carene*); according to which, the Ship should sink a determined quantity by a determined weight: but he makes a considerable mistake in simplifying his calculation; and thus the product being erroneous (as is shewn by M. V. du C.), the system built on such a foundation must consequently fall. However, as this Treatise is rather elementary than systematic, this error does not in the least affect what follows.

What Mr. CHAPMAN says of the Centres of Oscillation and Percussion, in relation to Rolling and Pitching, may be found in the good Writers of our nation (French), particularly in M. BIZOUT's "Mechanics." From every thing that has been said on this subject we may conclude, that to lessen this motion the most considerable weight must be removed to the sides, in order to give what is termed a greater *inert momentum*. It is right to remark in this place, that this rule, although founded upon just principles, has been sometimes misunderstood. The Stability of more than one vessel has been lost by placing a large quantity of iron ballast in the wings, because they have exhausted the hold, by removing so great a weight to the extremes of the floor timbers. In a Ship that has but a sufficient Stability, the weight in the wings must be regulated by the quantity on board not to exceed a determined proportion.

The Chapter which treats of the Resistance a Ship meets in her course through the Water, appears to us to contain sufficient lights (which has been noticed by other Authors from the intelligence he has afforded); and when taken up by those men of genius who interest themselves in this important question, may bring to maturity this long wished-for fruit, not expected from a single individual.

The Ship being motionless, every part of her bottom is pressed by the fluid in which it is immersed: when she is moving, the resistance of the water is to be considered, as well as the quantity of motion in the Ship; but towards the stern, the Ship rising from the water, there is a cessation or a kind of negative impulse on that part, the consequence of a positive impulse on the head, which should be added to the force with which it resists the motion of the head. This is the opinion of Mr. CHAPMAN; in consequence of which, he calculates the resistance on the head and towards the stern according to a compound *ratio*, in a manner perfectly satisfactory. He makes a sum of the resistance, which he rectifies with great judgment, by taking into consideration the elevation of the water towards the stern, and its declining as it recedes. He gives examples of this calculation in every sense complete.

The Power of the Wind upon the Sails is a Subject Mr. CHAPMAN treats with great ability, and he considers the Quantity of Sail proportioned to the Stability of the Ship. Without speaking of the force

force of the wind, which is one of the elements, he from experience draws a conclusion which, at the same time that it conveys information to the professional man, is perfectly intelligible to those who are not.

In the Sixth Chapter the Forms and Dimensions of Ships are discussed, which must be well received from a Builder, and from which great utility may result. In this also were some trifling errors, which M. V. du C. has corrected.

He has constructed a Table of the Proportions, Capacity, &c. of Merchant Ships of four classes, which must have been the result of deep investigation: Builders only can declare its true value by applying it to the finest Ships. If this Table is really as good as we have reason to think, it is a most valuable production. He has not omitted to give a practical proof.

The Author in his Seventh Chapter enters into the same discussion respecting Chacing Ships, which is applicable to Frigates, and directly serviceable to the Royal Navy. Nothing escapes him; Masts, Sails, Rigging, Men, Military Stores, Provisions, Stowage, the Weight of every particular, their Disposition in the Hold, every thing is considered. He gives general outlines, which agree to all Ships of War not of the Line, from which he forms several Tables, of which we may say the same that has been said of the preceding.

It is for the Officers employed in Building, and the Corps of Engineers, to say their value, by comparing them with those Ships of War which are allowed to excel. It is for those gentlemen also to make them square with Ships of the Line, many particulars applying to either. This may be expected from those gentlemen at a convenient time.

The Eighth Chapter is confined to treat of the Dimensions, Sails, and Rigging of Merchants Ships. Economy should modify this theory.

We find in the following Chapter the Practical Part of Ship-Building. He begins with Tables of the Dimensions of the Timbers. Mr. CHAPMAN gives a method of finding the exact cube of every piece; and by means of the weight and place of each piece, to determine both the centre of gravity and weight of the whole building. He then enters upon the method of laying down the plan of a Frigate on the best construction. Young Officers, who wish to understand this art, will find here what they will in vain seek elsewhere. This Chapter finishes with the method of making the Scale of Solidity, which may, from its simple construction, be very useful.

Mr. CHAPMAN displays his whole Theory of Resistance in the Tenth Chapter, to determine the place of the Masts, so that the vessel may keep her wind well, and not gripe too much; and considers the centre of the impulse on the Hull in conjunction with the centre of the power of the wind on the sails. He gives an example of a long calculation, which may be depended on, as Mr. CHAPMAN shews it perfectly coincides with the principles on which those Ships which answer the most perfectly were built. He demonstrates geometrically, that a Ship with masts placed according to the old theory is no way manageable.

In the Eleventh and last Chapter he has considered the method of Measuring a Ship, and other instructions more particularly serviceable to Privateers, but which may nevertheless be of some service to the Navy in respect to Transports which Government may have occasion to freight.

In the original there is a Twelfth Chapter, which solely relates to the great work of the Author in Plates, entitled, "Naval Architecture," &c. and which is but a repetition of what accompanies the said work.

NUMBER XI.

NAVAL COMMUNICATIONS.

To Mr. SEWELL.

Schleswig, Feb. 7, 1791.

DEAR SIR,

IT was but lately that I received your kind Letter of the 8th of Sept. 1790, having been almost without interruption travelling through the different parts of Denmark, on purpose to get the more and more convinced of your country being by far a better cultivated and more flourishing one than my own. Sorry as I am to confess this truth, I think it by far more becoming for a person labouring under some disease to investigate its nature, on purpose to apply proper remedies, than to conceal what at last must prove fatal in a high degree, and be the cause of the destruction of the whole body. Disagreeable and mortifying as it undoubtedly must be to me, to live in a country which probably may require more than a century before it can reach that degree of common happiness and welfare, which the Grand Author of the World seems to have intended for all nations, and which a few of them really enjoy, I rejoice in considering that men shall not live for themselves only, but that they shall serve the interests of the community at large, which are most wisely and wonderfully connected with that of every individual. Thus it is, that hitherto I have been able to resist, by way of reasoning, the most ardent desire of returning to Old England, where civil and religious liberty, tranquillity of mind, and all the various comforts of life, are fallen to the share, not of a few, but of the greater number, if we calculate fairly, and make due allowance for the obstructions set by many to their own happiness. Time must shew if the flattering hopes of being of some service to my country are not

in vain, and particularly if our Government will further go on with the same spirit of improvement it has done in later times. I need not remind you of the great precariousness of all improvements, under a constitution like that Heaven hath wrathfully disgraced this country with; and how easily the best plans of management, in a nod almost, are overthrown by a new set of Ministers, disliking what in vain, and particularly if our Government will further go on with their predecessors did, because they possess different principles, or merely because we must censure others, to shew ourselves to be great men. Should it happen, which God forbid, that the abolition of bondage, and other real improvements which but lately have been introduced, in spite of all the struggles of self-interested parties, and that new clouds should darken the promising prospect which has been opened to the eyes of the true lovers of their country and of mankind, I shall, perhaps, not hesitate any longer to return to that fortunate Island, which long since has been the great object of my wishes, and which I cannot, even now, think on without regret. You see, Sir, that it is merely a chance but that I may visit you again; and if that should be the case, I shall look upon you as a man who will be glad to receive an exiled stranger, taking refuge in a better country, to make preparation there for his entrance into a better world.

I need not tell you, that your excellent plan for promoting Naval Architecture has likewise, here in Denmark, met with that approbation which its usefulness, and the probable advantages arising therefrom, seem to require. It has long been a matter of surprise to me, why in a country where almost every useful art, by study and application, has been brought to a high degree of perfection, that of Ship-building, the real source of your wealth and greatness at home and abroad, has always been totally left to the disposition of mere practice, without theory; and it was a reflection of this kind which induced me to give credit to the assertion of one of our Naval Officers, who, having been sent by Government into England to study there the art of Ship-building, assured me, that your proficiency in that most useful art had, by far, not answered his expectations. There is no doubt but that your exertions for promoting the public good will prove successful; and I heartily rejoice in considering what honour this new and great undertaking reflects on those men and that country which produced it. A copy of those Papers you have been kind enough to send me, I have communicated to one of the Chiefs in the King's Dock-yard at Copenhagen; and I dare venture to assert, that he will know how to make a proper use of it.

My having been continually on the road, will sufficiently apologize for not having yet fulfilled my promise with respect to the biographical accounts of some of our celebrated men. Few as they may be in number, I hope still to discharge this debt, as soon as I shall have arrived to a more quiet and more regular course of life.

Whether you be in London or in the picturesque tracts of Kent, my thoughts and my best wishes are still your unseen companions.

I am ever

Your sincere Friend, and
Obedient Servant,

T. W. O.

The following ADVERTISEMENTS having been communicated to us by a Respectable MERCHANT of the CITY of LONDON, we present them to our Readers, with their Translations, as we received them, deeming ourselves at the same time by no means responsible for the authenticity or probability of their contents.

ENDSEBENANNTER macht hiemit die anzeige, daß er unter andern mechanischen arbeiten auf die erfindung gekommen-schiffe von jeder Grösse ohne beyhilfe von masten, seegel und tauwerk, nur vermittelst eines andern *mechanismi* in bewegung zu setzen. Die einrichtung desselben ist einfach, dauerhaft und ungleich weniger kostspielig, als masten und zubehorden. Bey windstille und sturm, wie auch bey jedem und so gar widrigem wind wird die fahrt nicht unterbrochen: und dis nicht allein auf der hohen see, sondern auch bey ein: und auslaufen in den flüssen und seehafen.—Den ubergrossen nutzen dieser erfindung werden die mit der schiffarth bekannte leicht ermessen; denn sie wird die Schiffbruche weit seltener machen, und dadurch menschenleben und guter sparen: sie erleichtert ferner das seewesen, indeme durch diesen *mechanismum* alle *manœuvres*, aufgenommen diejenige mit dem steuerruder aufhoren.

Die weitere aufschlusse uber diesen gegenstand wird auf Verlangen bereitwilligst geben.—*Augsburg, den 25. Febr. 1791.*

ZU meiner letztern anzeige vom 25ten Febr. *b. a.* fuge noch die nachricht, daß in meinem hause das model von meinem schiffs-*mechanismo* in hinlanglicher und zum beweis meiner ankündigung dienenden Grösse innerhalb wenig Tagen im wasser aufgestellt zu sehen ist. Es betragt ungefahr den sechsten theil von derjenigen mechanischen erprobten einrichtung, die bey windstille oder widrigen winden zur forthegung eines Kriegsschiffs vom ersten rang erforderlich ist.—Sonsten hat mein *mechanismus* die eigenschaft, daß man ihm sowohl eine schwache als auch eine *gradatim* steigende ausserordentlich starke triebkraft in geschwinder abwechselung nach willkühr mittheilen kann, die winde mogen wehen woher sie wollen: daher wird es auch begreiflich, wenn ich behaupte, daß er im sturm die trefflichsten dienste thut; denn, wenn wind und wellen in ihrer heftigkeit das schiff von seiner fahrt wollen abweichen machen, oder gar an land treiben, so darf man nur den *mechanismum* dergestalt heftig in trieb setzen und so zu sagen, uberwiegend wuthen lassen, so kann beydes nicht geschehen. Die schiffsbefatzung darf deswegen nicht zahlreicher als gewöhnlich seyn. Auch die schiffspompen können an meine *machine* angehangt und durch solche geschwind oder langsam in bewegung gebracht, folglich das schiffsvolk mit dieser ermudenden arbeit verschont werden. Ueberhaupts wird diese erfindung, die grösste *revolution* in der seefahrt und handlung hervorbringen; und zugleich so wohlthatig in ihren folgen, als schonend fur die seefahrer seyn.—Vorderstamst ist sie fur alle *respectiv* Seemachte Republique, und See-Stadt geeignet: die senstehe zu befehl und werde deren abgeordneten zur einsehung des models so wie zu dessen nachmachung, alle nothige aufschlusse nach vorheriger uebereinkunft geben.—Von nichtkaufern muß mir aber jedeg Verlangen nach dessen einsicht verbitten.—*Augsburg, den 7. Merz. 1791.*

THE undermentioned informs the Public, that among a variety of mechanical labours he has invented a machine to procure motion to ships of any burthen or dimension, without the assistance of masts, sails, ropes, &c. Its mechanism is simple, lasting, and more economical than masts and rigging.

In a calm or a storm, in any and even in the most contrary winds, the course of the ship remains uninterrupted; and this not only on the high seas, but also in sailing in or out of rivers and harbours.

The considerable utility of this invention will strike those who are acquainted with the art of navigation; it will prevent the frequent losses of ships, and consequently save the lives of many mariners and loss of merchandizes. It further improves and facilitates navigation; since by this mechanism all manœuvres, except those of the helm or rudder, will cease.—*Augsburg, the 25. Feb. 1791.*

I ADD to my Advertisement of the 25th Feb. the notice, that at my house the model of my ship's mechanism, of a sufficient dimension to prove what I advanced, will be put up in water in a few days. It contains about one-sixth part of the mechanical arrangement tried before, which in case of a calm or contrary winds is requisite for the motion of a man of war of the first rate. Besides this, my mechanism has the property, that a slow as well as a gradual arising extraordinary strong power in quick or slow gradation can be given, as necessity or fancy requires, let the winds blow from any point. It is therefore clear if I maintain, that in a storm it must be of superior service; because if wind and waves with their utmost force will put the ship off its course, or even drive it towards the shore, it only requires to set the mechanism in the utmost force, and so to say, let it rage with even all its overbalancing power, putting the ship off its course or running a-shore will be prevented.

There will be no occasion for a more numerous ship's crew.

The pumps can be hung to this machine, and by that means they will work quick or slow; and the seamen will therefore be saved from fatigue and labour.

Upon the whole, this invention will produce one of the greatest revolutions in navigation and trade, and prove as beneficial in its consequences as saving for the mariners. This machine may become the property of any maritime power; and after a previous agreement, I am ready to explain to their agents the whole property of the model for copying the same, with all requisite explanations of its use.

None but purchasers need make application.

Augsburg, 7th March, 1791.

* * * The British Ambassador at the Court of Munich, on his return to England, in passing through Augsburg, had explanations given to him by Professor Heinle of his invention of a machine for ships. Holland pays likewise attention to it; but particularly the Russian Government. The *Chargé d'Affaires* of the Russian Court at Munich has personally called on the Inventor to transmit the particulars of it to the Empress.

10th April 1791.

Extract of a Letter from TEIGNMOUTH, March 1.

"LAST week came in here his Majesty's cutter THE TRIAL, commanded by LIEUT. MALBON. She is built on an entire new construction, with three sliding keels, which are inclosed in a case or well; one forward, one midship, and the other abaft; they are worked with great facility, and are not of the least inconvenience to the crew when manœuvring the vessel. Her length is 66 feet, breadth 21, her hold seven feet, and measures 120 tons; has a perfect flat bottom; only draws six feet water, whereas all others of her tonnage on the old construction draw fourteen; so that by such an easy draft of water, she can go with safety into almost any harbour or creek whatever. In the construction of her, straight timber is chiefly used, by which article alone (without mentioning the many other extraordinary properties belonging to her not possessed by other ships) an immense saving is made of one half of the price of building a vessel of the same tonnage on the old construction. By means of her sliding keels, when at sea, which let down six feet below her bottom, she is kept perfectly steady in the greatest gale, and when at anchor she rides more upright and even than any other ship can do; and I was informed by the master, that the keels work as perfectly in a storm as in still water; that she is quite easy in a great sea, does not strain in the least, and never takes in water on her deck. She sails incomparably fast, either before or upon a wind; no vessel she has ever been in company with, of equal size (even though copper-bottomed, which she is not), has been able, upon many trials, to beat her in sailing, and yet her sails seem too small.

"Her hold is divided into several compartments, all water-tight, and so contrived, that should even a plank or two start at sea in different parts of the vessel, she may afterwards be navigated with the greatest security to any part of the world: a method hitherto never thought of before this ingenious officer contrived it, and which may be the means of saving thousands of valuable lives, and large quantities of merchandise: besides, if she should be driven on shore in a gale of wind, she does not soon become a wreck; for her keels will all naturally be driven up into their cases, and the ship being flat-bottomed, she cannot easily be overset; and all the crew may be saved, with perfect security, by her being able to go into such shallow water.

"The world is indebted for these discoveries to JOHN SCHANK, Esq. of Barton-house, Dawlish. a Captain in the Royal Navy, who had the command of the King's ships of war on the Great Lakes of America in the last war.

"Great merit is due to LORD CHATHAM, and the present LORDS of the ADMIRALTY, who, getting the better of all former prejudices, ordered this vessel to be constructed."

WE, the OFFICERS of HIS MAJESTY'S CUTTER the TRIAL, do hereby certify, That the said Cutter with three sliding keels does, from the effect of the keels, tack, wear, steer upon a wind, sail fast, work to windward, and hold a good wind; and that the keels work with ease, and are not attended with any inconvenience to the working

ing of the vessel. And we also certify, that we see no difference in heaving up or down the keels in blowing weather or in a sea, but that they work equally well in all sorts of weather, and that these keels are, in our opinion, a great improvement, and are also capable of still greater improvement. And we further certify, that when the vessel rolls deep in a high sea, we do not observe that the keels strain the vessel, the wells, dock, beams, or sides, or are in the least attended with any bad consequences, but, on the contrary, when down, make the vessel much easier, and prevent her rolling so quick. And we do further certify, that we never were in any vessel of her size and draft of water that sailed faster, or carried a greater press of sail, or made better weather. And we also certify, that such of the seamen who have sailed in cutters say, "that they never were in one so dry, or that made such good weather." We further certify, that it is our opinion, that if the four bulkheads in the hold were taken away, and that her masts and sails were in proportion to her tonnage, and that she was coppered, notwithstanding her uncommon strength, she would sail much faster than she now does. And we also certify, that from the third inst. to the date hereof, we have never been in company with any vessel (the ALARM Custom-house Lugger* excepted) that we can with justice say has beat the TRIAL. We further certify, that we came into Teignmouth in order to satisfy ourselves with respect to the condition of the wells and keels, before we reported the vessel to their Lordships, and having cleared the hold near them, do not find that they are in the least degree affected, or do leak or are even damp. And lastly, we certify, that we have attended strictly to the instructions given us by Captain SCHANK, and have found them, with his observations, to prove the utility of the keels, and their effects on the vessels working and sailing; all which we hope will meet with their Lordships approbation.

MICAH MALBON, Lieut. Commander.

WILLIAM MILNE, Master.

WILLIAM MALLETT, Midshipman.

JOHN WRIGHT, Midshipman.

TRIAL, Teignmouth, Feb. 21, 1791.

N U M B E R XII.

A SERIES of ANSWERS to QUESTIONS relative to OAK-TIMBER and SHIP-BUILDING.

QUESTION 1. Has the price of Oak Timber increased; and if it has, how much since 1771?

Answer. A.—Large Timber has increased in price from 1771 to 1785 10s. per load.

Middling-sized Timber within the same period 6s. per load.

* This Vessel is much longer, has more sails, and cannot be put on any comparison with the TRIAL, being also copper bottomed.

That which is fit for carpenters use within the same period 1s. 6d. per load.

B.—The price of Timber has increased on an average of sizes about 14 per cent. since 1771.

C.—Large Oak Timber has encreased in price since the year 1771, from 7s. 6d. to 10s. per load.

Quest. 2. Do you think the quantity of each of these kinds now growing in England has decreased; and if so, in what proportion within the same time?

Answer. A.—The large Timber, from the greater consumption from 1774 to 1785, has decreased in the counties within my knowledge, viz. Hants, Suffex, Surrey, Kent, Middlesex, Essex, Suffolk, Norfolk, Oxfordshire, and Berkshire, one tenth part.

The middling size within the same period one twentieth.

The small, as sooner coming to growth fit for carpenters use, has decreased only in proportion as woodlands have been stubbed up.

B.—The quantity of Timber fit to fall, or nearly approaching to that state, has certainly decreased in a considerable degree, though I cannot ascertain the exact proportion.

C.—The consumption of Oak Timber between the years 1777 and 1783 was more than for the twenty preceding years; as in 1783 there were forty-three sail of the Line, and fifty-two of 44 gun Ships, Frigates, and Sloops, building in the public and private Yards, besides ten sail of East-India Ships, of 900 tons each.

The demand likewise for Navy and Victualling Transports was, during that period, so great, that more Merchant Ships were built to the Northward between those years than for thirty years before.

Quest. 3. Has the consumption of Timber for Naval use increased in that time?

Answer. A.—The consumption of Timber for Naval uses increased from 1774 to 1785 beyond what this country ever experienced in three times the number of years.

B.—The consumption of Naval Timber has certainly increased; which increase is, among other causes, to be principally attributed to the impolitic system adopted by the India Company in the great extension of the dimensions of their Ships,

C.—Answered by the Second.

Quest. 4. If you should be of opinion, that the quantity of Timber growing has decreased very much, that the consumption for the Navy and trading Ships is greater, and yet the price is not much greater than

than in 1771; to what cause do you impute there not being a greater rise in the price?

Answer. A.—The little fluctuation of price of Oak Timber has been principally owing to the steadiness of Government's contract prices.

B.—The improvement of roads and inland navigation has prevented Timber from rising in proportion to the diminution of the existing quantity.

C.—That the price of Timber did not advance in proportion to the increased consumption, was owing to the large quantities brought to market from the years 1780 to 1783, when the Proprietors thereof, being certain of a sure sale, were induced to avail themselves of that opportunity.

Quest. 5. Has the price of Ships built in private dock-yards, either for the Navy or East-India Company, risen; and if so, how much since 1771?

Answer. A.—Line of battle Ships have increased 12s. *per* ton.

Frigates 7s. 6d. *per* ton.

Ships of 800 tons, for the East India Company's service, 40s. *per* ton.

B.—The price of Ships built for the Navy since 1771 has risen about 10 *per cent.* and the price of East India Ships has risen in the same period at the same rate; though their size, scantlings, &c. being much increased, as well as their iron work, they become so much more expensive to the Builder in proportion, that the rise of price is at least counterbalanced, and they may be in truth said to be built on as low or lower terms than in 1771; but this paradox is solved by the annihilation of the Builder's profit.

C.—No King's Ships have been contracted for in the private Yards since the year 1783; and there has been no great alteration in the price of India or other Merchant Ships, but what has arisen from casual causes.

Quest. 6. Is the expence to the Public of building a Ship in the Royal dock-yards greater or less than purchasing a Ship of equal rate and tonnage built in private dock-yards, reckoning the price *per* load of Timber used the same in both? And if there be any material difference, be so good as to mention what, in your opinion, is the cause of it.

Answer. A.—If into the calculation of the expence of building any Ships in the Royal dock-yards is admitted that Ship's proportion of all the yard-rent and expences, as is the case in calculations in private yards, it will be found that they will be at least double the expence of those built in the latter.

The

The causes are various.

Much larger meetings and more unprofitable Timber are purchased.

Large quantities of that purchased by an overstock and long keeping, are rendered unfit for use.

Extraordinary mode of conversion.

Very great difference in expence of workmanship.

Extraordinary consumption of various materials used in building, not a part of the Ships in Royal yards, &c. &c.

B.—There cannot be a doubt but that Ships built in the Royal dock-yards are much more expensive than those built by contract. The expence of the latter is known, while it would be extremely difficult to ascertain with precision that of the former. I should suppose, however, that we may venture to call the difference one-third of the price. The cause arises from the great expence of carrying on a work in the Royal yards, and the universal peculation which pervades almost every department.

C.—The expence of building a King's Ship in a public or private Yard, must be nearly equal, if the price of Timber and other materials be the same, as the difference of labour cannot be very material; provided, however, it may be admitted, that the same economy is attended to in the conversion of Timber in the public Yards, that must necessarily be observed in a private Yard. There can be no difference in the duration of Ships built in the public or private Yards, provided each Ship is built of the same growth of Timber, on a dry soil, and each has the same time to season.

Quest. 7. Is there any difference, and if any, what difference in the duration of Ships of War built or purchased?

Answer. A.—Ships built in private yards, that have had equal time for seasoning and building, and have been impartially treated under survey and repair, have been under similar circumstances equally durable with those built in the Royal yards.

B.—The duration of Ships depending upon so many fortuitous circumstances, renders this Question very difficult to be answered with accuracy. The Ships, however, which have been built by contract in the reputable private yards on the River, seem in general to have lasted as long, and worn as well, as those built in the Royal yards.

Quest. 8. What is the cause of such difference; and what do you consider to be the duration of each at a medium, according to the mode of building hitherto used?

Answer. A.—The answer to the 7th Question fully answers the former part of the 8th.

It is difficult to average the duration of Ships of war. The only approach to truth herein must arise from examination of official naval documents.

B. The

B.—The immense repairs which have been given to many Ships, even at an expence exceeding that of their original building, precludes a decisive reply to this Question.

C.—The duration of Ships depends altogether on their stations. Two Ships built agreeable to *Answer 7.* the one employed or stationed in a hot climate, will be rendered useless in a medium of twelve years; the same Ship employed in a cold climate, may remain serviceable from thirty to forty, or longer: Witness many colliers of that age now in existence.

Quest. 9. Can you suggest any improvement by which the duration of Ships would be increased, and in which the expence would not exceed the value of the Timber saved? And if you can, be so good as to state it.

Answer. A.—By contracting for Ships of war in private yards in the River Thames, limiting the time for seasoning in the various stages of building, and finishing them in such a time of the year as shall secure them from damps, would be the truest œconomy, and the means of obtaining a succession of well-seasoned Ships for the support of the Navy at a much cheaper rate, and prevent disappointment, and the necessity that arises in time of war of building in great haste and with unseasoned materials.

Laying them up under cover, with every possible part opened for a free current of dry air, would be the best preservative.

B.—Working all the plank and thick stuff, and fastening it on with a few bolts only, boring all the trennel holes, and leaving them open, in which state the Ship standing a considerable time before the trennels are driven, the very heart of the Timber, &c. will be seasoned. This is no new suggestion, having been some years practised on the East India Ships, with whose Surveyor, Mr. SNODGRASS, I believe the idea originated.

C.—The duration of Ships may be much encreased, by having them built on slips on a dry soil, and on a temporary keel; and the mode of building I would recommend as follows:

Let her be completely framed, and continue in that state for six months; then work the wales and strakes below to light draughts of water, and up to the gun-wales, or upper part, not regarding the ports, but to shut them close in; and preparing the fills for the ports when framing, as the plank in the wake of the same may be cut out when wanted.

Fasten the outside planks with a sufficient quantity of small bolts, to keep each plank close to the timbers.

Bore the usual quantity of holes for tree-nails, but drive none of them till all moisture is dried through the timber.

Work your clamps for your beams, and inside stuff, in wake of your deck knees. Get in your beams, carlings and ledges, proceeding upwards with laying either lower or middle deck, till you come to the upper deck, which must be laid, caulked, and as well secured as if the ship was at sea.

Get over the gun-wales and caulk the same. Drive good seasoned tree-nails in the upper part of the ship, when you think the juices are exhausted, and caulk the same, to prevent the wet getting in. Continue to preserve the upper part of the ship tight and dry; which may be done by erecting a house or shed over her. By these means the air will find a circulation through the ship, and preserve her from rot; and she will remain in that state for a great number of years without receiving any injury.

The season following I would recommend her to be got in so forward a state, as that she might be launched in three months, in case of emergency.

Quest. 10. Has Government any competitor beside the East-India Company in the purchase of large Oak Timber?

Answer. A.—Great quantities of Oak Staves for the brewery have been, in the last twelve years, cut from the clean part of the bodies of large Oak Trees, and several very extensively in that trade are wholly supplied therewith from the county of Suffex.

B.—None for the Timber appropriated to Ships of the line,

C.—No Trade requires ships of so large a scantling as the East-India commerce.

Quest. 11. What do you understand to be the medium duration of East-India Ships?

Answer. A.—Fifteen years.

B.—In and out of the service seventeen or eighteen years.

C.—About twelve years.

Quest. 12. Are the East-India Ships broken up after four voyages, or after what number? And is the Timber taken out of such Ships of much or any use in building other Ships for the Navy or East-India service?

Answer. A.—East India Ships have generally been broken up after four voyages, and have been found too unsound to apply any part of them to building Ships of war, or for the same service.

The East India Company have thought proper in 1788 to permit Ships to go five or six voyages.

B.—India Ships never went more than four voyages till lately, but now some go five or six; however, they are seldom broken up on quitting that service, being generally bought for the purpose of transports or mast Ships, &c. Some have been sold for foreign East India service.

C.—It depends much on the service the Ships are employed in; some go four, some six voyages. Others, by being detained four or five years in India, are so injured by the warmth and changeable seasons,

seasons, as to be wore out in two voyages. The experiment of using old materials in the construction of new Ships has been tried, but I believe never with success.

Quest. 13. Has any substitute been found for British Oak in Ship-building that was not used before 1771?

Answer. A.—None that I know of.

B.—None.

C.—Iron knees are found to be good substitutes for wooden ones; and it is to be hoped will be universally introduced into the Navy. For to procure proper wooden knees, the Timber Merchants must cut many valuable pieces of large Oak, the butt ends of which are rendered unserviceable but for the use of the coopers, which must make them come high, and be a great waste of Timber.

In lieu therefore of wooden knees and standards, I would propose iron standards and hanging knees; the beam arm to be considerably longer than the present wooden knees; and I would raise the midship end of the arm of the knee that is fastened to the beam, that the bolts may not be drove in a straight line with the grain, which frequently occasions the splitting of the beam.

The East-India Company have introduced iron hanging knees and standards, and find them answer well, as many of them have made their voyage to India and back without accident or complaint; notwithstanding they are much more uneasy at sea than King's Ships, from the different form of their bodies. They are likewise cheaper than wooden ones, as they do not rot the wood so much where they lay against, not covering so much surface; and may be shifted when the ship is worn out to another.

Query. Is Ash Timber or Spanish Chesnut used for Knees; if so, in what quantity do you suppose them to be used? Are they found to answer the purpose, and to be nearly as durable as Oak?

Answer. A.—Have never seen any used in Ship-building.

B.—Neither have been used within my knowledge.

C.—I have never tried either Ashen or Chesnut knees, therefore cannot give an opinion about them.

Quest. 14. Do Ash, Spanish Chesnut, and Oak require different soils; or would the soil on which either of the two first grow produce Oak of equal size?

Answer. A.—So far as I have observed, the soil favourable to the growth of Oak is equally so to the other two.

C.—An Oak requires a fine marl, where it grows very fast; so much so, that in fifty years it will be a handsome tree, of good texture

texture, and durable. Both Ash and Spanish Chesnut thrive best on the same kind of soil.

Quest. 15. Do you know what is the common duration of the Russia Ships built of Larch or Larinx Timber?

Answer. A.—I do not.

B.—I believe ten or twelve years.

C.—If the Russia Ships built of Larch or Larinx Timber were to be employed in a hot climate for five or six years, I should think they would in that time be in a decayed state.

Quest. 16. As Larch will grow on soils unfit for Oak, do you not think that the planting of that tree should be encouraged, with a view to the future supply of the Navy?

Answer. A.—As Larch will grow on soil unfit for Oak, it is to me the strongest proof that the cultivation of it would be useless with a view to a future supply for the Navy.

B.—It might be applicable to many purposes, and the planting it certainly wants encouragement.

C.—Many persons have planted great quantities of Firs to the Northward; but I do not find or believe that they answer so well as those imported from abroad.

Quest. 17. Do you suppose that more ground has been planted within your recollection, than there has been of woodland turned into tillage?

Answer. A.—I am certain not within the counties of Middlesex, Essex, Suffolk, Cambridgeshire, Norfolk, Berkshire, Oxfordshire, Kent, Surrey, and Sussex.

B.—I think more ground has been planted than has been grubbed in a considerable proportion; for as the price of Timber has risen, the eyes of the land-owner have been opened, and immense plantations have been made in many counties: add to which, that the present system of laying-out grounds ornamental to the seats of men of fortune, will in time furnish no inconsiderable supply of Timber. Upon the whole, I am inclined to believe that the want of Timber will be experienced for forty or fifty years to come, yet at the expiration of 100 years it will be in greater plenty than has been in our time.

C.—The demand for Timber in the years I have before mentioned was so great, that the owners of woodlands cut down large and small, and converted them into tillage; and I am truly sorry to remark it as my firm belief, that where one Oak has been planted, ten have been cut down.

To Mr. SEWELL.

DEAR SIR,

TO my Answer to your several Questions, which I have given to the best of my judgement, permit me to add several general hints respecting Timber and Ship-building.

I am of opinion too much large British Oak is used in the Ordnance departments, where Quebec would answer the purpose; the price given for their large scantling, converted and squared, requires, and has induced many to cut up the butt ends of very valuable British Oak Timber.

The Brewery has been the means of cutting up (particularly in Suffex) a vast quantity of the finest Timber; two or three lengths of butt staves from the body, in order to leave a large knee at the top with a part of the body for one arm, whose unequal contents have swelled the measurements, and produced a price that enabled them to mangle the body, otherwise fit for the first Naval uses.

With respect to Ships of the Navy, I am well persuaded such is their general state, that was a war soon to happen, Government must have recourse to the immediate assistance of private yards to hurry up some to counteract our enemies.

Great would be the advantage arising from a gradual and constant succession of Ships in private yards. Their price, times, and modes of seasoning, building, and launching, judiciously regulated, the Timber, by a gradual supply, would not be enhanced; and, what is of real consequence, the body of Shipwrights, finding constant employment, would be better regulated as to number and abilities. It is a melancholy truth, that great numbers taken apprentice during the American war have had no employment since, and have been turned out of work with a business half-learned, and many of them have been obliged to go abroad for work; and sure I am, that the body of working Shipwrights are much inferior to those of twenty years back; nor do I see any possible remedy but a permanent succession of Navy business to revive the spirit and superior excellence of British Ship-building.

The late Acts of Parliament respecting Registers of Ships, and other regulations intended to increase British Ship-building, has not hitherto operated in their favour. Not more than four Ships for the West-India trade have been built in the River in the last two years, only four for the East-India Company; and so great is the distress of Shipwrights, that 400 at least want employment, of those who have constantly depended on the River. Many are at work as labourers, porters, and ship-breakers; and very many so distressed as to sell their tools for bread for their families.

I think every well-wisher to this country must feel the importance of British Seamen and Shipwrights, and I am certain there never was a time when the latter had more claim to encouragement and support.

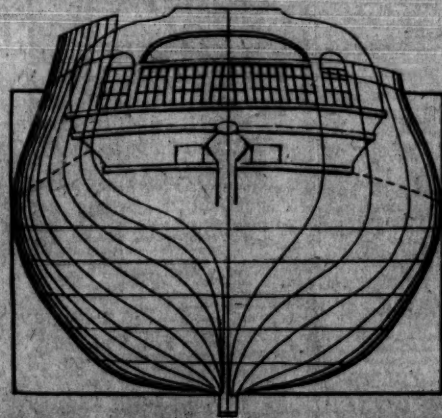
I am, &c.

March 19, 1789.

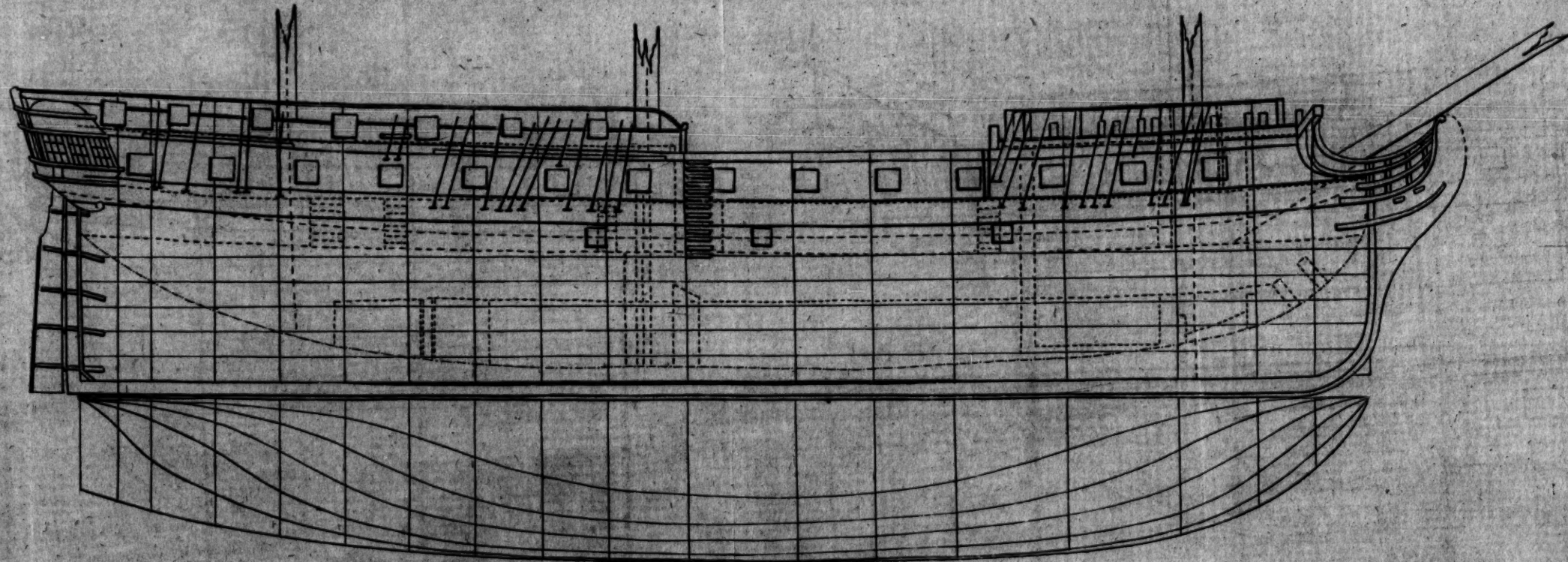
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L'ARTOIS FRIGATE,

PRINCIPAL DIMENSIONS



Length of upper Deck	158. 8
Keel for Tonnage	133. 1 $\frac{3}{8}$
Breadth Extreme	40. 4
Moulded	39. 8
Depth in Hold	13. 6
Burthen in Tons	1152 $\frac{3}{4}$



EUROPEAN MAGAZINE,
Published by J. Sewell, Cornhill Apr. 2. 1791.

APPENDIX,
FROM THE
EUROPEAN MAGAZINE
FOR
APRIL 1791.

A
PROPOSAL
FOR ESTABLISHING A
SOCIETY
FOR THE
IMPROVEMENT OF NAVAL ARCHITECTURE.

IN a Maritime and Commercial Country like Great Britain, it is evident that the *Art of Ship-building*, and the most effectual management of its *Naval* strength, are objects of the first magnitude and importance. The fleets of a kingdom so circumstanced, are the foundation and bulwark of its pre-eminence and superior consequence with neighbouring nations; they are also the safeguard of its commerce in time of war. The prosperity of that very commerce, and the safety with which our merchants are enabled to carry it on, depend very much upon the excellent construction of the ships in their service.

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It is also but too well known to all who have any skill in Naval Architecture, that the theory is not so well understood as it deserves; and that the French, actually surpassing us in this most important art, have derived many advantages from this superiority in time of war.

Now, in a country so fertile as Great Britain in men of genius, where the most skilful and industrious workmen are always to be found, and the best materials to be procured, nothing but public encouragement, and a firm union of theoretical with practical ability, can be wanting to produce the desired remedy, and enable us to excel, not only our neighbours the French, but all other maritime countries, in constructing *Ships of War* and *Merchantmen*.

For these reasons, and in order most effectually to accomplish so desirable a purpose, it is proposed to establish *A Society for the Improvement of Naval Architecture**; the grand object of which shall be, to improve and strengthen the Royal Navy of Great Britain, and our shipping in general, for the benefit both of the Public and merchants service.

To forward this important object, it will be necessary to render the mechanism of floating bodies a subject of general attention, and to engage skilful mathematicians and mechanics to assist the Society with their labours.—2. To make draughts and calculations, and to construct models of different vessels, with such improvements as have been adopted on the joint opinions of able Mathematicians and skilful Ship-builders, to be kept for public exhibition in some convenient room to be provided by the Society.—3. To distribute pecuniary and honorary rewards to such as make any useful experiments and observations on subjects suggested or approved of by the Society.

And if the Society should attain that magnitude and consistence which there is room to expect from the superior utility of the object, and the extraordinary public spirit that manifests itself whenever any thing really beneficial to mankind is proposed for general protection and encouragement,—AN ACADEMY may hereafter be instituted for the study of the Naval Sciences, and the Art of Ship-building,—5. Experiments may be made on a larger scale, and vessels actually built for the purpose, under the direction of the Society.

The bare inspection of the repository belonging to the *Society for the Encouragement of Arts, Manufactures, and Commerce*, in the Adelphi, and a perusal of the Transactions of that Patriotic Society, sufficiently shew the advantages which the husbandmen of this kingdom have derived from the invention of new, and the improvement of old instruments of husbandry of various kinds.

Civil Architecture has likewise employed the thoughts and pens of men of abilities, and we every day see edifices erected according to the improved rules of art, in which regularity, order, durability, and ornament, are united.

* We are happy to announce, that a Society to carry this Plan into execution is now formed, consisting of the most respectable Names for Rank and Science in the Kingdom. More than TWO HUNDRED AND FIFTY POUNDS are already subscribed, and further Contributions are daily receiving.

To what then can we attribute the neglect of a subject so important to a Maritime State as NAVAL ARCHITECTURE, but to the want of an attention to it by men of science and of practical knowledge, and to the small number of English authors of any repute upon the subject; but especially to a want of that point of union between theory and practice, which can be obtained by no other means but by the establishment of a Society for the purpose on the most general and liberal plan?

We are happy to announce to the Public, that the Proprietors of the EUROPEAN MAGAZINE have, with the most disinterested view, collected all the books they could procure on the Art of Ship-building, and the sciences connected with it; which may be seen and perused at any time at No. 32, Cornhill*; that they have also got together a variety of curious and useful models of vessels: and it is well known that they have printed a list of books, both foreign and domestic, that have been published on this subject, together with several documents and much information on Naval Architecture.

From small beginnings great National Institutions have frequently been established on an extensive scale. Such, for instance, is the present flourishing Society for the Encouragement of Arts, &c. founded in 1753, by the indefatigable industry of Mr. WILLIAM SHIPLEY, who, deriving no advantages from learning, address, or elocution, by unwearied personal attendance, found means to engage a few persons of rank and fortune to meet at Peele's Coffee-house in Fleet-Street, and to adopt a plan, simple in itself, but capable by improvement of producing the most beneficial effects to the Community. The meeting of a few intelligent, well-disposed individuals produced the *Humane, Philanthropic, and Medical Societies*. That great discovery in Optics, the *Acromatic Glasses*, was entirely owing to three or four ingenious men assembling at a public-house in Spital-fields to amuse themselves in friendly conversation upon mathematical and mechanical subjects.

Let us then indulge the pleasing hope, that similar success will attend the important design now humbly formed for the public benefit, and the Association now first proposed to be set on foot in order to improve and strengthen the *Wooden Walls of Old England*, the best *Fortifications of the British Islands*.

April 2, 1791.

IT is therefore proposed, that a Meeting do take place on Thursday the 14th inst. at the Crown and Anchor Tavern in the Strand, at 12 o'Clock at Noon, for the Purpose of choosing a Committee to consider of the best Means for the Establishment of such a Society.

** Where the same will be continued till a more advanced period of the Society arrives.*

A T

AT a Meeting held at the Crown and Anchor Tavern in the Strand, on Thursday the 14th inst. to take into consideration the expediency of instituting **A SOCIETY FOR THE IMPROVEMENT OF NAVAL ARCHITECTURE,**

The Right Hon. LORD RAWDON in the Chair,

The following Resolutions were moved, and unanimously agreed to, *viz.*

1. That the theory and art of Ship-building are objects of the first magnitude and importance to these kingdoms.
2. That the theory and art of Ship-building are not so well understood in this country as matters of so much consequence deserve.
3. That a remedy for this radical deficiency merits the attention of every well-wisher to the true interests of Great Britain.
4. That the most effectual remedy for this deficiency will be to concentrate the theoretical and practical wisdom of this country by the institution of a Society for the Improvement of Naval Architecture.
5. That such a Society be now instituted, under the direction of a President, Vice-Presidents, and such other Officers as shall hereafter be found necessary.
6. That His Royal Highness the DUKE OF CLARENCE be requested to accept the office of President of this Society, and to lay the plan of it before his Majesty; and that SIR JOHN BORLASE WARREN, Bart. be desired to signify this request of the Society to His Royal Highness.
7. That the Public be solicited to encourage the patriotic designs of this Society, and to support it by donations and annual subscriptions.
8. That a Committee be now appointed to consider the most effectual means for farther carrying this plan into immediate execution, and to report the same to a General Meeting; which is hereby invited for that purpose, on Wednesday the 20th instant, at the Crown and Anchor Tavern in the Strand, at twelve o'clock at noon precisely.

The Committee to consist of the following Gentlemen :

SIR JOSEPH BANKS,	MR. HALLETT,
SIR CHARLES KNOWLES,	MR. RANDALL,
SIR J. B. WARREN,	MR. ROGERS,
MR. BRENT,	MR. SEWELL,
DR. HUTTON,	MR. STALKAART,
PROFESSOR MARTYN,	MR. TENNANT.

9. That these Resolutions be published in the Newspapers, &c.
(Signed)

RAWDON, Chairman.

The thanks of the Meeting were given to the CHAIRMAN, and to
SIR JOSEPH BANKS.

AT a SECOND MEETING of the SOCIETY on WEDNESDAY the 20th of this instant *April*,

The Right Hon. LORD RAWDON in the Chair,

His Royal Highness the DUKE of CLARENCE having accepted the office of PRESIDENT, it was ordered—

“ That the grateful Thanks of this Meeting be presented to His Royal Highness the DUKE of CLARENCE for the honour he has done this Society in accepting the office of PRESIDENT ; and that his Royal Highness be requested to nominate six or more VICE-PRESIDENTS for the year ensuing.—And that the Right Hon. LORD RAWDON do wait upon His Royal Highness to acquaint him therewith.

“ That Every Person engaging at this or the next General Meeting (on *Friday* the 20th of *May*) to pay Two GUINEAS or upwards annually, shall be considered as a Member of this Society ; but that any one who shall pay TWENTY GUINEAS shall be released from the obligation to Annual Payments.

“ That Books be opened at Messrs. HANKEYS, HOARES, and DRUMMONDS, for receiving Donations and Subscriptions. And that the GENTLEMEN of the COMMITTEE do also receive them, and pay them to the said Bankers.

(Signed)

RAWDON, Chairman.

The RULES and ORDERS of the SOCIETY, as since arranged and settled by the COMMITTEE, may be had of J. SEWELL, No. 32, Cornhill.



A T A SECOND MEETING of the Society on Wednesday the 1st of January 1841

The Right Hon. LORD RAYDON in the Chair

The Royal Highness the Duke of Devonshire having been invited to the office of President, it was ordered—

That the general meeting of the Association be held on the 1st of March 1841 at the Duke of Devonshire's Palace, in the City of London, at 8 o'clock in the evening, for the purpose of receiving the report of the Committee, and of transacting the business of the Association. And that the Right Hon. Lord RAYDON be invited to preside at the meeting.

That the Committee be empowered to receive from any person who shall pay a subscription of one guinea or upwards, and to pay to any person who shall be entitled to receive the same, the sum of one guinea or upwards, as a subscription to the Association, and to receive the same from any person who shall be entitled to receive the same.

That the Committee be empowered to receive from any person who shall be entitled to receive the same, the sum of one guinea or upwards, as a subscription to the Association, and to receive the same from any person who shall be entitled to receive the same.

(Signed)

RAYDON, Chairman

The Right Hon. LORD RAYDON, Chairman of the Association, has the honor to inform you that the same has been received from you, and is being forwarded to the Committee.



